

Inequality Violations for Classical Polytope of the K_5 Event Graph

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4.181.1 Qbits	690
4.181.2 Qtrits	691
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4.182Equation 242	693
4.182.1 Qbits	693
4.182.2 Qtrits	694
4.182.3 Qquarts	695

1 Classifying the K5 inequalities

All the K5 inequalities can be found in the appendix. From (1) to (10) we have trivial inequalities for positivity of overlap. From (11) to (40) we have 3-cycle inequalities, which were already studied in [?]. From (41) to (60) we have the inequalities in the class of the new inequality of K_4 that is of the form $-r_{12}-r_{13}+r_{15}-r_{23}+r_{25}+r_{35} \leq 1$ and so on that we don't need to search for violations as we have already done in particular for this specific inequality. The labels we use are the same as the ones used to generate the inequalities in the appendix.

2 Table with violations for the K_5 inequalities

Violations of the K_5 inequalities using kets								
Ineq.	dim = 2	$\Delta t(s)$	dim = 3	$\Delta t(s)$	dim = 4	$\Delta t(s)$	Max. Viol.	MDV
61	no	4354	no	6208	yes: (1)	523	0.121	4
62	no	768	no	713	yes: (2)	1624	0.138	4
63	no	715	no	586	yes: (3)	511	0.243	4
64	no	1377	no	859	yes: (4)	932	0.167	4
65	no	517	no	578	yes: (5)	7227	0.1102	4
66*	yes: (6)	1887	yes: (7)	457	yes: (8)	565	0.2682	4
67	yes: (9)	21174	yes: (10)	3818	yes: (11)	19499	0.28816	4
68	yes: (12)	2438	yes: (13)	328	yes: (14)	1593	0.3043	3
69	yes: (15)	697	yes: (16)	1215	yes: (17)	1638	0.242	4
70	yes: (18)	2803	yes: (19)	1426	yes: (20)	373	0.28993	3
71	yes: (21)	23013	yes: (22)	4233	yes: (23)	3104	0.29565	3
72	yes: (24)	2528	yes: (25)	2345	yes: (26)	3113	0.31248	3
73	yes: (27)	510	yes: (28)	3973	yes: (29)	546	0.2939	3
74	yes: (30)	205	yes: (31)	158	yes: (32)	155	26059	3
75	yes: (33)	1019	yes: (34)	1490	yes: (35)	351	0.30706	3
76*	yes: (36)	178	yes: (37)	462	yes: (38)	264	0.6925	2
77	yes: (39)	333	yes: (40)	856	yes: (41)	374	0.6563	2
78	yes: (42)	17159	yes: (43)	13097	yes: (44)	644	0.73839	2
79	yes: (45)	24637	yes: (46)	4359	yes: (47)	8606	0.76098	2
80*	yes: (48)	1598	yes: (49)	64	yes: (50)	698	0.7609	2
81	yes: (51)	4763	yes: (52)	4012	yes: (53)	11936	0.72902	2
82	yes: (54)	3673	yes: (55)	2472	yes: (56)	2061	0.70870	2
83	yes: (57)	1103	yes: (58)	107	yes: (59)	2816	0.763345	2
84	yes: (60)	12024	yes: (61)	396	yes: (62)	675	0.74902	2
85	yes: (63)	1283	yes: (64)	1770	yes: (65)	7134	0.7312	2
86	yes: (66)	35921	yes: (67)	10567	yes: (68)	2772	0.76341	2
87	yes: (69)	253839	-	-	-	-	0.777579	2
88	no	2812	yes: (70)	104	yes: (71)	2324	0.258	4
89	no	-	yes: (72)	12350	yes: (73)	4840	0.2998	3
90	no	-	yes: (74)	12440	yes: (75)	1802	0.32429	3
91	no	-	yes: (76)	11264	yes: (77)	2169	0.34471	4
92*	no	815	yes: (78)	239	yes: (79)	383	0.265	3
93	yes: (80)	290	yes: (81)	389	yes: (82)	3698	0.556	2
94	yes: (83)	208	yes: (84)	28	yes: (85)	954	0.581	2
95	yes: (86)	6078	yes: (87)	12128	yes: (88)	1247	0.64416	2
96	yes: (89)	3656	yes: (90)	3760	yes: (91)	3401	0.6202	3
97	yes: (92)	7697	yes: (93)	1893	yes: (94)	2051	0.60633	2
98	yes: (95)	2787	yes: (96)	3978	yes: (97)	1837	0.61397	2
99	yes: (98)	4404	yes: (99)	6861	yes: (100)	343	0.61732	3
100	yes: (101)	471	yes: (102)	460	yes: (103)	677	0.623	2

Table 1: Witnessing quantum violations of coherence-free overlap inequalities. The times depicted were the running time to find maximal violations found. If no violation is found, we simply insert the time while the numerical experiment was performed. Whenever violations are witnessed they are linked to its corresponding vector and to its corresponding value in another section.¹⁷ MDV stands for Maximal Dimension of the Violation, that corresponds to the dimension for which the maximal violation of the inequality was found. Inequalities marked with * are particularly interesting ones.

Violations of the K_5 inequalities using kets								
Ineq.	dim = 2	$\Delta t(s)$	dim = 3	$\Delta t(s)$	dim = 4	$\Delta t(s)$	Max. Viol.	MDV
101	yes: (104)	844	yes: (105)	557	yes: (106)	5586	0.5242	2
102	yes: (107)	3978	yes: (108)	1244	yes: (109)	444	0.6125	2
103	yes: (110)	230	yes: (111)	156	yes: (112)	1142	0.608	2
104	yes: (113)	469	yes: (114)	135	yes: (115)	351	0.5718	2
105	yes: (116)	45508	yes: (117)	13997	yes: (118)	904	0.68885	3
106	yes: (119)	2388	yes: (120)	2706	yes: (121)	975	0.612323	2
107	yes: (122)	1302	yes: (123)	3352	yes: (124)	722	0.60003	2
108	yes: (125)	2378	yes: (126)	5029	yes: (127)	1003	0.62392	2
109	yes: (128)	0.31062	yes: (129)	31420	yes: (130)	13003	0.60166	2
110	yes: (131)	5044	yes: (132)	4931	yes: (133)	2757	0.64328	3
111	yes: (134)	1333	yes: (135)	4944	yes: (136)	2623	0.61312	3
112	yes: (137)	4827	yes: (138)	5686	yes: (139)	41033	0.61571	2
113	yes: (140)	16561	yes: (141)	15422	yes: (142)	28446	0.62979	2
114	yes: (143)	271	yes: (144)	15543	yes: (145)	11942	0.6189	2
115	yes: (146)	21602	yes: (147)	184	yes: (148)	1365	0.645236	2
116	yes: (149)	198	yes: (150)	1516	yes: (151)	1422	0.61673	2
117	yes: (152)	3930	yes: (153)	1926	yes: (154)	10609	0.6028	2
118	yes: (155)	3013	yes: (156)	3447	yes: 157	1498	0.65184	3
119	yes: (158)	566	yes: (159)	1709	yes: (160)	7965	0.63789	2
120	yes: (161)	441	yes: (162)	1225	yes: (163)	1861	0.61479	2
121	yes: (164)	1289	yes: (165)	3216	yes: (166)	864	0.60247	2
122	yes: (167)	10082	yes: (168)	42039	yes: (169)	1805	0.62951	2
123	yes: (170)	12944	yes: (171)	991	yes: (172)	746	0.61405	3
124	yes: (173)	3750	yes: (174)	10821	yes: (175)	9068	0.63653	2
125	yes: (176)	19831	yes: (177)	2020	yes: (178)	752	0.60523	2
126	yes: (179)	12155	yes: (180)	1737	yes: (181)	392	0.58709	2
127	yes: (182)	2701	yes: (183)	1083	yes: (184)	32455	0.6016411	2
128	yes: (185)	2695	yes: (186)	3017	yes: (187)	2557	0.6045	2
129	yes: (188)	3563	yes: (189)	4327	yes: (190)	3406	0.625644	3
130	yes: (191)	11823	yes: (192)	1762	yes: (193)	45327	0.6101005	2
131	yes: (194)	4559	yes: (195)	5932	yes: (196)	3185	0.65878	3
132	yes: (197)	3185	yes: (198)	3013	yes: (199)	2916	0.61057	2
133	yes: (200)	6119	yes: (201)	3325	yes: (202)	1700	0.62192	2
134	yes: (203)	808	yes: (204)	6022	yes: (205)	422	0.63347	3
135	yes: (206)	599	yes: (207)	44173	yes: (208)	1824	0.651903	3
136	yes: (209)	2647	yes: (210)	9262	yes: (211)	843	0.67465	3
137	yes: (212)	5862	yes: (213)	9619	yes: (214)	10089	0.62487	3
138	yes: (215)	9548	yes: (216)	1877	yes: (217)	13788	0.63710	2
139	yes: (218)	44805	yes: (219)	2697	yes: (220)	1282	0.631689	3
140	yes: (221)	4692	yes: (222)	586	yes: (223)	1231	0.64364	3

Table 2: Witnessing quantum violations of coherence-free overlap inequalities. The times depicted were the running time to find maximal violations found. If no violation is found, we simply insert the time while the numerical experiment was performed. Whenever violations are witnessed they are linked to its corresponding vector and to its corresponding value in another section. MDV stands for Maximal Dimension of the Violation, that corresponds to the dimension for which the maximal violation of the inequality was found. Inequalities marked with * are particularly interesting ones.

Violations of the K_5 inequalities using kets								
Ineq.	dim = 2	$\Delta t(s)$	dim = 3	$\Delta t(s)$	dim = 4	$\Delta t(s)$	Max. Viol.	MDV
141	yes: (224)	2498	yes: (225)	4406	yes: (226)	204	0.608259	2
142	yes: (227)	1218	yes: (228)	3121	yes: (229)	925	0.661188	3
143	yes: (230)	1748	yes: (231)	5758	yes: (232)	4994	0.614396	2
144	yes: (233)	1384	yes: (234)	2783	yes: (235)	3371	0.62751	2
145	yes: (236)	2935	yes: (237)	1014	yes: (238)	1075	0.554156	3
146	yes: (239)	1519	yes: (240)	3464	yes: (241)	2332	0.675329	3
147	yes: (242)	6020	yes: (243)	3847	yes: (244)	1935	0.611207	2
148	yes: (245)	1681	yes: (246)	63791	yes: (247)	662	0.624508	2
149	yes: (248)	620	yes: (249)	976	yes: (250)	228	0.63115	2
150	yes: (251)	2160	yes: (252)	2837	yes: (253)	45	0.60089	2
151	yes: (254)	1190	yes: (255)	2900	yes: (256)	1329	0.611007	2
152	yes: (257)	2074	yes: (258)	1490	yes: (259)	558	0.60888	2
153	yes: (260)	1927	yes: (261)	494	yes: (262)	328	0.675	2
154	yes: (263)	883	yes: (264)	477	yes: (265)	248	0.6729	2
155	yes: (266)	4021	yes: (267)	3811	yes: (268)	4726	0.69869	2
156	yes: (269)	10540	yes: (270)	45157	yes: (271)	5279	0.674295	2
157	yes: (272)	4166	yes: (273)	15428	yes: (274)	2445	0.67937	2
158	yes: (275)	6557	yes: (276)	3542	yes: (277)	5813	0.709117	2
159	yes: (278)	5959	yes: (279)	5080	yes: (280)	2121	0.68162	2
160	yes: (281)	3348	yes: (282)	3858	yes: (283)	8781	0.68403	2
161	yes: (284)	1318	yes: (285)	1262	yes: (286)	1098	0.69045	2
162	yes: (287)	2049	yes: (288)	1413	yes: (289)	2906	0.67005	2
163	yes: (290)	2226	yes: (291)	5566	yes: (292)	1625	0.68154	2
164	yes: (293)	554	yes: (294)	1639	yes: (295)	3190	0.69765	2
165	yes: (296)	6005	yes: (297)	870	yes: (298)	1169	0.684705	2
166	yes: (299)	1716	yes: (300)	956	yes: (301)	1084	0.691589	2
167	yes: (302)	2126	yes: (303)	2146	yes: (304)	1113	0.63685	2
168	yes: (305)	1359	yes: (306)	5547	yes: (307)	859	0.68091	2
169	yes: (308)	2769	yes: (309)	5694	yes: (310)	642	0.68393	2
170	yes: (311)	9909	yes: (312)	68494	yes: (313)	2076	0.695529	2
171	yes: (314)	7603	yes: (315)	3549	yes: (316)	1992	0.69251	2
172	yes: (317)	4771	yes: (318)	67031	yes: (319)	20945	0.696123	2
173	yes: (320)	3965	yes: (321)	6715	yes: (322)	2909	0.68948	2
174	yes: (323)	4095	yes: (324)	38362	yes: (325)	1452	0.681866	2
175	yes: (326)	2823	yes: (327)	1859	yes: (328)	2609	0.68643	2
176	yes: (329)	2365	yes: (330)	2932	yes: (331)	1308	0.66389	2
177	yes: (332)	8004	yes: (333)	3025	yes: (334)	2180	0.693855	2
178	yes: (335)	947	yes: (336)	12907	yes: (337)	9769	0.685595	2
179	yes: (338)	1651	yes: (339)	6373	yes: (340)	3087	0.702805	2
180	yes: (341)	3165	yes: (342)	47991	yes: (343)	1165	0.697803	2

Table 3: Witnessing quantum violations of coherence-free overlap inequalities. The times depicted were the running time to find maximal violations found. If no violation is found, we simply insert the time while the numerical experiment was performed. Whenever violations are witnessed they are linked to its corresponding vector and to its corresponding value in another section. MDV stands for Maximal Dimension of the Violation, that corresponds to the dimension for which the maximal violation of the inequality was found. Inequalities marked with * are particularly interesting ones.

Violations of the K_5 inequalities using kets								
Ineq.	dim = 2	$\Delta t(s)$	dim = 3	$\Delta t(s)$	dim = 4	$\Delta t(s)$	Max. Viol.	MDV
181	yes: (344)	970	yes: (345)	1301	yes: (346)	7062	0.681521	2
182	yes: (347)	4297	yes: (348)	1701	yes: (349)	622	0.694683	2
183	yes: (350)	1631	yes: (351)	3702	yes: (352)	5419	0.678241	2
184	yes: (353)	1823	yes: (354)	1993	yes: (355)	2684	0.685939	2
185	yes: (356)	2568	yes: (357)	2337	yes: (358)	317	0.689206	2
186	yes: (359)	1230	yes: (360)	2445	yes: (361)	1362	0.713166	2
187	yes: (362)	919	yes: (363)	1235	yes: (364)	4744	0.71593	2
188	yes: (365)	5990	yes: (366)	3708	yes: (367)	609	0.714659	2
189	yes: (368)	10136	yes: (369)	1442	yes: (370)	696	0.689819	2
190	yes: (371)	3358	yes: (372)	10462	yes: (373)	1201	0.702513	2
191	yes: (374)	10061	yes: (375)	2253	yes: (376)	1711	0.709683	2
192	yes: (377)	2055	yes: (378)	11337	yes: (379)	1183	0.661453	2
193	yes: (380)	81787	yes: (381)	3036	yes: (382)	9667	0.700167	2
194	yes: (383)	3297	yes: (384)	983	yes: (385)	1129	0.702928	2
195	yes: (386)	1093	yes: (387)	1341	yes: (388)	3728	0.69331	2
196	yes: (389)	521	yes: (390)	8023	yes: (391)	914	0.683105	2
197	yes: (392)	31771	yes: (393)	918	yes: (394)	3299	0.7080006	2
198	yes: (395)	1680	yes: (396)	5377	yes: (397)	2988	0.71375	2
199	yes: (398)	2352	yes: (399)	1522	yes: (400)	1945	0.683149	2
200	yes: (401)	5364	yes: (402)	9425	yes: (403)	1736	0.7306949	2
201	yes: (404)	4035	yes: (405)	3058	yes: (406)	8060	0.684725	2
202	yes: (407)	2427	yes: (408)	2354	yes: (409)	1008	0.703766	2
203	yes: (410)	2426	yes: (411)	15187	yes: (412)	1873	0.6924307	2
204	yes: (413)	2435	yes: (414)	4475	yes: (415)	1419	0.71635	2
205	yes: (416)	1957	yes: (417)	3995	yes: (418)	3347	0.712958	2
206	yes: (419)	1834	yes: (420)	470	yes: (421)	17863	0.68093	3
207	yes: (422)	781	yes: (423)	424	yes: (424)	18262	0.696291	2
208	yes: (425)	1578	yes: (426)	1490	yes: (427)	926	0.661048	2
209	yes: (428)	11370	yes: (429)	1112	yes: (430)	1790	0.713006	2
210	yes: (431)	63835	yes: (432)	1015	yes: (433)	9199	0.711009	2
211	yes: (434)	2154	yes: (435)	1343	yes: (436)	2050	0.667643	2
212	yes: (437)	913	yes: (438)	579	yes: (439)	393	0.639	2
213	yes: (440)	1454	yes: (441)	382	yes: (442)	123	0.615	3
214	yes: (443)	2278	yes: (444)	3885	yes: (445)	201	0.724	3
215	yes: (446)	4125	yes: (447)	622	yes: (448)	57	0.7319	3
216	yes: (449)	2850	yes: (450)	272	yes: (451)	790	0.707	3
217	yes: (452)	32	yes: (453)	1983	yes: (454)	1411	0.63	3
218	yes: (455)	4395	yes: (456)	5632	yes: (457)	183	0.706	3
219	yes: (458)	633	yes: (459)	720	yes: (460)	445	0.65266	3
220	yes: (461)	1915	yes: (462)	1241	yes: (463)	201	0.7290	3
221*	yes: (464)	1319	yes: (465)	18000	yes: (466)	696	0.8515	3
222	yes: (467)	3768	yes: (468)	47888	yes: (469)	2732	0.73645	3
223	yes: (470)	928	yes: (471)	2426	yes: (472)	633	0.7316	3
224	yes: (473)	1418	yes: (474)	8770	yes: (475)	1210	0.73011	3
225	yes: (476)	6595	yes: (477)	1197	yes: (478)	73867	0.7288	3

Violations of the K_5 inequalities using kets								
Ineq.	dim = 2	$\Delta t(s)$	dim = 3	$\Delta t(s)$	dim = 4	$\Delta t(s)$	Max. Viol.	MDV
226	yes: (479)	1412	yes: (480)	1623	yes: (481)	5342	0.7966481	3
227	yes: (482)	1160	yes: (483)	15743	yes: (484)	2217	0.792068	3
228	yes: (485)	10706	yes: (486)	5212	yes: (487)	1623	0.7107906	3
229	yes: (488)	1766	yes: (489)	824	yes: (490)	1082	0.8069041	3
230	yes: (491)	3683	yes: (492)	5819	yes: (493)	1223	0.798487	3
231	yes: (494)	1156	yes: (495)	739	yes: (496)	453	0.829168	3
232	yes: (497)	3438	yes: (498)	12638	yes: (499)	1467	0.855766	3
233	yes: (500)	3187	yes: (501)	1701	yes: (502)	2141	0.7015402	3
234	yes: (503)	8658	yes: (504)	6850	yes: (505)	4478	0.821719	3
235	yes: (506)	6811	yes: (507)	3312	yes: (508)	5993	0.784549	3
236	yes: (509)	1810	yes: (510)	16730	yes: (511)	1340	0.813196	3
237	yes: (512)	6651	yes: (513)	581	yes: (514)	45720	0.7619498	3
238	yes: (515)	16738	yes: (516)	5613	yes: (517)	927	0.79425	3
239	yes: (518)	21827	yes: (519)	1378	yes: (520)	1547	0.792881	3
240	yes: (521)	1312	yes: (522)	4745	yes: (523)	897	0.768852	3
241	yes: (524)	3092	yes: (525)	2714	yes: (526)	1580	0.729943	3
242	yes: (527)	1729	yes: (528)	1494	yes: (529)	2341	0.777759	3

3 Full set of classical inequalities for K_5

- (1) $-r_{12} \leq 0$
- (2) $-r_{13} \leq 0$
- (3) $-r_{14} \leq 0$
- (4) $-r_{15} \leq 0$
- (5) $-r_{23} \leq 0$
- (6) $-r_{24} \leq 0$
- (7) $-r_{25} \leq 0$
- (8) $-r_{34} \leq 0$
- (9) $-r_{35} \leq 0$
- (10) $-r_{45} \leq 0$
- (11) $-r_{12} + r_{15} + r_{25} \leq 1$
- (12) $-r_{12} + r_{14} + r_{24} \leq 1$
- (13) $-r_{12} + r_{13} + r_{23} \leq 1$
- (14) $-r_{13} + r_{15} + r_{35} \leq 1$
- (15) $-r_{13} + r_{14} + r_{34} \leq 1$
- (16) $-r_{14} + r_{15} + r_{45} \leq 1$
- (17) $-r_{23} + r_{25} + r_{35} \leq 1$
- (18) $-r_{23} + r_{24} + r_{34} \leq 1$
- (19) $-r_{24} + r_{25} + r_{45} \leq 1$
- (20) $-r_{34} + r_{35} + r_{45} \leq 1$
- (21) $+r_{34} - r_{35} + r_{45} \leq 1$
- (22) $+r_{34} + r_{35} - r_{45} \leq 1$
- (23) $+r_{24} - r_{25} + r_{45} \leq 1$
- (24) $+r_{24} + r_{25} - r_{45} \leq 1$
- (25) $+r_{23} - r_{24} + r_{34} \leq 1$
- (26) $+r_{23} - r_{25} + r_{35} \leq 1$
- (27) $+r_{23} + r_{25} - r_{35} \leq 1$
- (28) $+r_{23} + r_{24} - r_{34} \leq 1$
- (29) $+r_{14} - r_{15} + r_{45} \leq 1$
- (30) $+r_{14} + r_{15} - r_{45} \leq 1$
- (31) $+r_{13} - r_{14} + r_{34} \leq 1$
- (32) $+r_{13} - r_{15} + r_{35} \leq 1$
- (33) $+r_{13} + r_{15} - r_{35} \leq 1$
- (34) $+r_{13} + r_{14} - r_{34} \leq 1$
- (35) $+r_{12} - r_{13} + r_{23} \leq 1$
- (36) $+r_{12} - r_{14} + r_{24} \leq 1$
- (37) $+r_{12} - r_{15} + r_{25} \leq 1$
- (38) $+r_{12} + r_{15} - r_{25} \leq 1$
- (39) $+r_{12} + r_{14} - r_{24} \leq 1$
- (40) $+r_{12} + r_{13} - r_{23} \leq 1$
- (41) $-r_{12} - r_{13} + r_{15} - r_{23} + r_{25} + r_{35} \leq 1$
- (42) $-r_{12} - r_{13} + r_{14} - r_{23} + r_{24} + r_{34} \leq 1$
- (43) $-r_{12} - r_{14} + r_{15} - r_{24} + r_{25} + r_{45} \leq 1$
- (44) $-r_{12} + r_{14} - r_{15} + r_{24} - r_{25} + r_{45} \leq 1$

$$\begin{aligned}
(45) & -r_{12} + r_{13} - r_{14} + r_{23} - r_{24} + r_{34} \leq 1 \\
(46) & -r_{12} + r_{13} - r_{15} + r_{23} - r_{25} + r_{35} \leq 1 \\
(47) & -r_{13} - r_{14} + r_{15} - r_{34} + r_{35} + r_{45} \leq 1 \\
(48) & -r_{13} + r_{14} - r_{15} + r_{34} - r_{35} + r_{45} \leq 1 \\
(49) & -r_{23} - r_{24} + r_{25} - r_{34} + r_{35} + r_{45} \leq 1 \\
(50) & -r_{23} + r_{24} - r_{25} + r_{34} - r_{35} + r_{45} \leq 1 \\
(51) & +r_{23} - r_{24} - r_{25} + r_{34} + r_{35} - r_{45} \leq 1 \\
(52) & +r_{23} + r_{24} + r_{25} - r_{34} - r_{35} - r_{45} \leq 1 \\
(53) & +r_{13} - r_{14} - r_{15} + r_{34} + r_{35} - r_{45} \leq 1 \\
(54) & +r_{13} + r_{14} + r_{15} - r_{34} - r_{35} - r_{45} \leq 1 \\
(55) & +r_{12} - r_{13} - r_{14} + r_{23} + r_{24} - r_{34} \leq 1 \\
(56) & +r_{12} - r_{13} - r_{15} + r_{23} + r_{25} - r_{35} \leq 1 \\
(57) & +r_{12} - r_{14} - r_{15} + r_{24} + r_{25} - r_{45} \leq 1 \\
(58) & +r_{12} + r_{14} + r_{15} - r_{24} - r_{25} - r_{45} \leq 1 \\
(59) & +r_{12} + r_{13} + r_{15} - r_{23} - r_{25} - r_{35} \leq 1 \\
(60) & +r_{12} + r_{13} + r_{14} - r_{23} - r_{24} - r_{34} \leq 1 \\
(61) & -r_{12} - r_{13} - r_{14} + r_{15} - r_{23} - r_{24} + r_{25} - r_{34} + r_{35} + r_{45} \leq 1 \\
(62) & -r_{12} - r_{13} + r_{14} - r_{15} - r_{23} + r_{24} - r_{25} + r_{34} - r_{35} + r_{45} \leq 1 \\
(63) & -r_{12} + r_{13} - r_{14} - r_{15} + r_{23} - r_{24} - r_{25} + r_{34} + r_{35} - r_{45} \leq 1 \\
(64) & +r_{12} - r_{13} - r_{14} - r_{15} + r_{23} + r_{24} + r_{25} - r_{34} - r_{35} - r_{45} \leq 1 \\
(65) & +r_{12} + r_{13} + r_{14} + r_{15} - r_{23} - r_{24} - r_{25} - r_{34} - r_{35} - r_{45} \leq 1 \\
(66) & -r_{12} - r_{13} + r_{14} + r_{15} - r_{23} + r_{24} + r_{25} + r_{34} + r_{35} - r_{45} \leq 2 \\
(67) & -r_{12} + r_{13} - r_{14} + r_{15} + r_{23} - r_{24} + r_{25} + r_{34} - r_{35} + r_{45} \leq 2 \\
(68) & -r_{12} + r_{13} + r_{14} - r_{15} + r_{23} + r_{24} - r_{25} - r_{34} + r_{35} + r_{45} \leq 2 \\
(69) & -r_{12} + r_{13} + r_{14} + r_{15} + r_{23} + r_{24} + r_{25} - r_{34} - r_{35} - r_{45} \leq 2 \\
(70) & +r_{12} - r_{13} - r_{14} + r_{15} + r_{23} + r_{24} - r_{25} - r_{34} + r_{35} + r_{45} \leq 2 \\
(71) & +r_{12} - r_{13} + r_{14} - r_{15} + r_{23} - r_{24} + r_{25} + r_{34} - r_{35} + r_{45} \leq 2 \\
(72) & +r_{12} - r_{13} + r_{14} + r_{15} + r_{23} - r_{24} - r_{25} + r_{34} + r_{35} - r_{45} \leq 2 \\
(73) & +r_{12} + r_{13} - r_{14} - r_{15} - r_{23} + r_{24} + r_{25} + r_{34} + r_{35} - r_{45} \leq 2 \\
(74) & +r_{12} + r_{13} - r_{14} + r_{15} - r_{23} + r_{24} - r_{25} + r_{34} - r_{35} + r_{45} \leq 2 \\
(75) & +r_{12} + r_{13} + r_{14} - r_{15} - r_{23} - r_{24} + r_{25} - r_{34} + r_{35} + r_{45} \leq 2 \\
(76) & -r_{12} - r_{13} + r_{14} + r_{15} + r_{23} - r_{24} + r_{25} + r_{34} - r_{35} - r_{45} \leq 2 \\
(77) & -r_{12} - r_{13} + r_{14} + r_{15} + r_{23} + r_{24} - r_{25} - r_{34} + r_{35} - r_{45} \leq 2 \\
(78) & -r_{12} + r_{13} - r_{14} + r_{15} - r_{23} + r_{24} + r_{25} + r_{34} - r_{35} - r_{45} \leq 2 \\
(79) & -r_{12} + r_{13} - r_{14} + r_{15} + r_{23} + r_{24} - r_{25} - r_{34} - r_{35} + r_{45} \leq 2 \\
(80) & -r_{12} + r_{13} + r_{14} - r_{15} - r_{23} + r_{24} + r_{25} - r_{34} + r_{35} - r_{45} \leq 2 \\
(81) & -r_{12} + r_{13} + r_{14} - r_{15} + r_{23} - r_{24} + r_{25} - r_{34} - r_{35} + r_{45} \leq 2 \\
(82) & +r_{12} - r_{13} - r_{14} + r_{15} - r_{23} + r_{24} - r_{25} + r_{34} + r_{35} - r_{45} \leq 2 \\
(83) & +r_{12} - r_{13} - r_{14} + r_{15} + r_{23} - r_{24} - r_{25} + r_{34} - r_{35} + r_{45} \leq 2 \\
(84) & +r_{12} - r_{13} + r_{14} - r_{15} - r_{23} - r_{24} + r_{25} + r_{34} + r_{35} - r_{45} \leq 2 \\
(85) & +r_{12} - r_{13} + r_{14} - r_{15} + r_{23} - r_{24} - r_{25} - r_{34} + r_{35} + r_{45} \leq 2 \\
(86) & +r_{12} + r_{13} - r_{14} - r_{15} - r_{23} - r_{24} + r_{25} + r_{34} - r_{35} + r_{45} \leq 2 \\
(87) & +r_{12} + r_{13} - r_{14} - r_{15} - r_{23} + r_{24} - r_{25} - r_{34} + r_{35} + r_{45} \leq 2 \\
(88) & -r_{12} - r_{13} - r_{14} + 2r_{15} - r_{23} - r_{24} + 2r_{25} - r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(89) & -r_{12} - r_{13} + 2r_{14} - r_{15} - r_{23} + 2r_{24} - r_{25} + 2r_{34} - r_{35} + 2r_{45} \leq 3 \\
(90) & -r_{12} + 2r_{13} - r_{14} - r_{15} + 2r_{23} - r_{24} - r_{25} + 2r_{34} + 2r_{35} - r_{45} \leq 3
\end{aligned}$$

$$\begin{aligned}
(91) &+ 2r_{12} - r_{13} - r_{14} - r_{15} + 2r_{23} + 2r_{24} + 2r_{25} - r_{34} - r_{35} - r_{45} \leq 3 \\
(92) &+ 2r_{12} + 2r_{13} + 2r_{14} + 2r_{15} - r_{23} - r_{24} - r_{25} - r_{34} - r_{35} - r_{45} \leq 3 \\
(93) &- 2r_{12} - 2r_{13} + 2r_{15} - 2r_{24} + 2r_{25} + r_{34} + r_{35} + r_{45} \leq 3 \\
(94) &- 2r_{12} - 2r_{13} + 2r_{15} + r_{24} + r_{25} - 2r_{34} + 2r_{35} + r_{45} \leq 3 \\
(95) &- 2r_{12} - 2r_{13} + 2r_{14} + r_{24} + r_{25} + 2r_{34} - 2r_{35} + r_{45} \leq 3 \\
(96) &- 2r_{12} - 2r_{13} + 2r_{14} + 2r_{24} - 2r_{25} + r_{34} + r_{35} + r_{45} \leq 3 \\
(97) &- 2r_{12} - 2r_{14} + 2r_{15} - 2r_{23} + 2r_{25} + r_{34} + r_{35} + r_{45} \leq 3 \\
(98) &- 2r_{12} - 2r_{14} + 2r_{15} + r_{23} + r_{25} - 2r_{34} + r_{35} + 2r_{45} \leq 3 \\
(99) &- 2r_{12} + r_{14} + r_{15} - 2r_{23} + 2r_{25} - 2r_{34} + 2r_{35} + r_{45} \leq 3 \\
(100) &- 2r_{12} + r_{14} + r_{15} - 2r_{23} + 2r_{24} + 2r_{34} - 2r_{35} + r_{45} \leq 3 \\
(101) &- 2r_{12} + 2r_{14} - 2r_{15} - 2r_{23} + 2r_{24} + r_{34} + r_{35} + r_{45} \leq 3 \\
(102) &- 2r_{12} + 2r_{14} - 2r_{15} + r_{23} + r_{24} + r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(103) &- 2r_{12} + r_{13} + r_{15} - 2r_{24} + 2r_{25} - 2r_{34} + r_{35} + 2r_{45} \leq 3 \\
(104) &- 2r_{12} + r_{13} + r_{15} + 2r_{23} - 2r_{24} + 2r_{34} + r_{35} - 2r_{45} \leq 3 \\
(105) &- 2r_{12} + r_{13} + r_{14} + 2r_{24} - 2r_{25} + r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(106) &- 2r_{12} + r_{13} + r_{14} + 2r_{23} - 2r_{25} + r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(107) &- 2r_{12} + 2r_{13} - 2r_{14} + r_{23} + r_{25} + 2r_{34} + r_{35} - 2r_{45} \leq 3 \\
(108) &- 2r_{12} + 2r_{13} - 2r_{14} + 2r_{23} - 2r_{25} + r_{34} + r_{35} + r_{45} \leq 3 \\
(109) &- 2r_{12} + 2r_{13} - 2r_{15} + r_{23} + r_{24} + r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(110) &- 2r_{12} + 2r_{13} - 2r_{15} + 2r_{23} - 2r_{24} + r_{34} + r_{35} + r_{45} \leq 3 \\
(111) &- 2r_{13} - 2r_{14} + 2r_{15} - 2r_{23} + r_{24} + r_{25} + 2r_{35} + r_{45} \leq 3 \\
(112) &- 2r_{13} - 2r_{14} + 2r_{15} + r_{23} - 2r_{24} + r_{25} + r_{35} + 2r_{45} \leq 3 \\
(113) &- 2r_{13} + r_{14} + r_{15} - 2r_{23} - 2r_{24} + 2r_{25} + 2r_{35} + r_{45} \leq 3 \\
(114) &- 2r_{13} + r_{14} + r_{15} - 2r_{23} + 2r_{24} - 2r_{25} + 2r_{34} + r_{45} \leq 3 \\
(115) &- 2r_{13} + 2r_{14} - 2r_{15} - 2r_{23} + r_{24} + r_{25} + 2r_{34} + r_{45} \leq 3 \\
(116) &- 2r_{13} + 2r_{14} - 2r_{15} + r_{23} + r_{24} - 2r_{25} + r_{34} + 2r_{45} \leq 3 \\
(117) &+ r_{13} - 2r_{14} + r_{15} - 2r_{23} - 2r_{24} + 2r_{25} + r_{35} + 2r_{45} \leq 3 \\
(118) &+ r_{13} - 2r_{14} + r_{15} + 2r_{23} - 2r_{24} - 2r_{25} + 2r_{34} + r_{35} \leq 3 \\
(119) &+ r_{13} + r_{14} - 2r_{15} - 2r_{23} + 2r_{24} - 2r_{25} + r_{34} + 2r_{45} \leq 3 \\
(120) &+ r_{13} + r_{14} - 2r_{15} + 2r_{23} - 2r_{24} - 2r_{25} + r_{34} + 2r_{35} \leq 3 \\
(121) &+ 2r_{13} - 2r_{14} - 2r_{15} + r_{23} - 2r_{24} + r_{25} + 2r_{34} + r_{35} \leq 3 \\
(122) &+ 2r_{13} - 2r_{14} - 2r_{15} + r_{23} + r_{24} - 2r_{25} + r_{34} + 2r_{35} \leq 3 \\
(123) &+ r_{12} - 2r_{13} + r_{15} - 2r_{24} + r_{25} - 2r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(124) &+ r_{12} - 2r_{13} + r_{15} + 2r_{23} + 2r_{24} + r_{25} - 2r_{34} - 2r_{45} \leq 3 \\
(125) &+ r_{12} - 2r_{13} + r_{14} + r_{24} - 2r_{25} + 2r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(126) &+ r_{12} - 2r_{13} + r_{14} + 2r_{23} + r_{24} + 2r_{25} - 2r_{35} - 2r_{45} \leq 3 \\
(127) &+ r_{12} - 2r_{14} + r_{15} - 2r_{23} + r_{25} - 2r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(128) &+ r_{12} - 2r_{14} + r_{15} + 2r_{23} + 2r_{24} + r_{25} - 2r_{34} - 2r_{35} \leq 3 \\
(129) &+ r_{12} + r_{14} - 2r_{15} - 2r_{23} + r_{24} + 2r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(130) &+ r_{12} + r_{14} - 2r_{15} + 2r_{23} + r_{24} + 2r_{25} - 2r_{34} - 2r_{35} \leq 3 \\
(131) &+ r_{12} + r_{13} - 2r_{14} + r_{23} - 2r_{25} + 2r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(132) &+ r_{12} + r_{13} - 2r_{14} + r_{23} + 2r_{24} + 2r_{25} - 2r_{35} - 2r_{45} \leq 3 \\
(133) &+ r_{12} + r_{13} - 2r_{15} + r_{23} - 2r_{24} + 2r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(134) &+ r_{12} + r_{13} - 2r_{15} + r_{23} + 2r_{24} + 2r_{25} - 2r_{34} - 2r_{45} \leq 3 \\
(135) &+ r_{12} + r_{13} + 2r_{14} + 2r_{15} + r_{23} - 2r_{24} - 2r_{35} - 2r_{45} \leq 3 \\
(136) &+ r_{12} + r_{13} + 2r_{14} + 2r_{15} + r_{23} - 2r_{25} - 2r_{34} - 2r_{45} \leq 3
\end{aligned}$$

$$\begin{aligned}
(137) &+ r_{12} + 2r_{13} + r_{14} + 2r_{15} - 2r_{23} + r_{24} - 2r_{35} - 2r_{45} \leq 3 \\
(138) &+ r_{12} + 2r_{13} + r_{14} + 2r_{15} + r_{24} - 2r_{25} - 2r_{34} - 2r_{35} \leq 3 \\
(139) &+ r_{12} + 2r_{13} + 2r_{14} + r_{15} - 2r_{23} + r_{25} - 2r_{34} - 2r_{45} \leq 3 \\
(140) &+ r_{12} + 2r_{13} + 2r_{14} + r_{15} - 2r_{24} + r_{25} - 2r_{34} - 2r_{35} \leq 3 \\
(141) &+ 2r_{12} - 2r_{13} - 2r_{14} + r_{23} + 2r_{24} + r_{25} + r_{35} - 2r_{45} \leq 3 \\
(142) &+ 2r_{12} - 2r_{13} - 2r_{14} + 2r_{23} + r_{24} + r_{25} - 2r_{35} + r_{45} \leq 3 \\
(143) &+ 2r_{12} - 2r_{13} - 2r_{15} + r_{23} + r_{24} + 2r_{25} + r_{34} - 2r_{45} \leq 3 \\
(144) &+ 2r_{12} - 2r_{13} - 2r_{15} + 2r_{23} + r_{24} + r_{25} - 2r_{34} + r_{45} \leq 3 \\
(145) &+ 2r_{12} - 2r_{14} - 2r_{15} + r_{23} + r_{24} + 2r_{25} + r_{34} - 2r_{35} \leq 3 \\
(146) &+ 2r_{12} - 2r_{14} - 2r_{15} + r_{23} + 2r_{24} + r_{25} - 2r_{34} + r_{35} \leq 3 \\
(147) &+ 2r_{12} + r_{13} + r_{14} + 2r_{15} - 2r_{23} - 2r_{25} + r_{34} - 2r_{45} \leq 3 \\
(148) &+ 2r_{12} + r_{13} + r_{14} + 2r_{15} - 2r_{24} - 2r_{25} + r_{34} - 2r_{35} \leq 3 \\
(149) &+ 2r_{12} + r_{13} + 2r_{14} + r_{15} - 2r_{23} - 2r_{24} + r_{35} - 2r_{45} \leq 3 \\
(150) &+ 2r_{12} + r_{13} + 2r_{14} + r_{15} - 2r_{24} - 2r_{25} - 2r_{34} + r_{35} \leq 3 \\
(151) &+ 2r_{12} + 2r_{13} + r_{14} + r_{15} - 2r_{23} - 2r_{24} - 2r_{35} + r_{45} \leq 3 \\
(152) &+ 2r_{12} + 2r_{13} + r_{14} + r_{15} - 2r_{23} - 2r_{25} - 2r_{34} + r_{45} \leq 3 \\
(153) &- 2r_{12} - 2r_{13} + 2r_{15} - r_{23} + r_{24} + 2r_{25} + r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(154) &- 2r_{12} - 2r_{13} + 2r_{14} - r_{23} + 2r_{24} + r_{25} + 2r_{34} + r_{35} - 2r_{45} \leq 3 \\
(155) &- 2r_{12} - r_{13} + r_{14} + 2r_{15} - 2r_{23} + 2r_{25} + r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(156) &- 2r_{12} - r_{13} + 2r_{14} + r_{15} - 2r_{23} + 2r_{24} + 2r_{34} + r_{35} - 2r_{45} \leq 3 \\
(157) &- 2r_{12} - 2r_{14} + 2r_{15} + r_{23} - r_{24} + 2r_{25} + r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(158) &- 2r_{12} + r_{14} + r_{15} + 2r_{23} + 2r_{24} + 2r_{25} - 2r_{34} - 2r_{35} - r_{45} \leq 3 \\
(159) &- 2r_{12} + 2r_{14} - 2r_{15} + r_{23} + 2r_{24} - r_{25} - 2r_{34} + r_{35} + 2r_{45} \leq 3 \\
(160) &- 2r_{12} + r_{13} - r_{14} + 2r_{15} - 2r_{24} + 2r_{25} + r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(161) &- 2r_{12} + r_{13} + r_{15} + 2r_{23} + 2r_{24} + 2r_{25} - 2r_{34} - r_{35} - 2r_{45} \leq 3 \\
(162) &- 2r_{12} + r_{13} + r_{14} + 2r_{23} + 2r_{24} + 2r_{25} - r_{34} - 2r_{35} - 2r_{45} \leq 3 \\
(163) &- 2r_{12} + r_{13} + 2r_{14} - r_{15} + 2r_{24} - 2r_{25} - 2r_{34} + r_{35} + 2r_{45} \leq 3 \\
(164) &- 2r_{12} + 2r_{13} - 2r_{14} + 2r_{23} - r_{24} + r_{25} + 2r_{34} - 2r_{35} + r_{45} \leq 3 \\
(165) &- 2r_{12} + 2r_{13} - r_{14} + r_{15} + 2r_{23} - 2r_{24} + 2r_{34} - 2r_{35} + r_{45} \leq 3 \\
(166) &- 2r_{12} + 2r_{13} - 2r_{15} + 2r_{23} + r_{24} - r_{25} - 2r_{34} + 2r_{35} + r_{45} \leq 3 \\
(167) &- 2r_{12} + 2r_{13} + r_{14} - r_{15} + 2r_{23} - 2r_{25} - 2r_{34} + 2r_{35} + r_{45} \leq 3 \\
(168) &- 2r_{12} + 2r_{13} + 2r_{14} + 2r_{15} + r_{24} + r_{25} - 2r_{34} - 2r_{35} - r_{45} \leq 3 \\
(169) &- 2r_{12} + 2r_{13} + 2r_{14} + 2r_{15} + r_{23} + r_{25} - 2r_{34} - r_{35} - 2r_{45} \leq 3 \\
(170) &- 2r_{12} + 2r_{13} + 2r_{14} + 2r_{15} + r_{23} + r_{24} - r_{34} - 2r_{35} - 2r_{45} \leq 3 \\
(171) &- r_{12} - 2r_{13} + r_{14} + 2r_{15} - 2r_{23} + r_{24} + 2r_{25} + 2r_{35} - 2r_{45} \leq 3 \\
(172) &- r_{12} - 2r_{13} + 2r_{14} + r_{15} - 2r_{23} + 2r_{24} + r_{25} + 2r_{34} - 2r_{45} \leq 3 \\
(173) &- r_{12} + r_{13} - 2r_{14} + 2r_{15} + r_{23} - 2r_{24} + 2r_{25} - 2r_{35} + 2r_{45} \leq 3 \\
(174) &- r_{12} + r_{13} + 2r_{14} - 2r_{15} + r_{23} + 2r_{24} - 2r_{25} - 2r_{34} + 2r_{45} \leq 3 \\
(175) &- r_{12} + 2r_{13} - 2r_{14} + r_{15} + 2r_{23} - 2r_{24} + r_{25} + 2r_{34} - 2r_{35} \leq 3 \\
(176) &- r_{12} + 2r_{13} + r_{14} - 2r_{15} + 2r_{23} + r_{24} - 2r_{25} - 2r_{34} + 2r_{35} \leq 3 \\
(177) &- 2r_{13} - 2r_{14} + 2r_{15} + r_{23} + r_{24} - 2r_{25} - r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(178) &- 2r_{13} + r_{14} + r_{15} + 2r_{23} - 2r_{24} - 2r_{25} + 2r_{34} + 2r_{35} - r_{45} \leq 3 \\
(179) &- 2r_{13} + 2r_{14} - 2r_{15} + r_{23} - 2r_{24} + r_{25} + 2r_{34} - r_{35} + 2r_{45} \leq 3 \\
(180) &+ r_{13} - 2r_{14} + r_{15} - 2r_{23} + 2r_{24} - 2r_{25} + 2r_{34} - r_{35} + 2r_{45} \leq 3 \\
(181) &+ r_{13} + r_{14} - 2r_{15} - 2r_{23} - 2r_{24} + 2r_{25} - r_{34} + 2r_{35} + 2r_{45} \leq 3
\end{aligned}$$

$$\begin{aligned}
(182) &+ 2r_{13} - 2r_{14} - 2r_{15} - 2r_{23} + r_{24} + r_{25} + 2r_{34} + 2r_{35} - r_{45} \leq 3 \\
(183) &+ r_{12} - 2r_{13} - r_{14} + 2r_{15} + r_{24} - 2r_{25} - 2r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(184) &+ r_{12} - 2r_{13} + r_{15} + 2r_{23} - 2r_{24} - r_{25} + 2r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(185) &+ r_{12} - 2r_{13} + r_{14} + 2r_{23} - r_{24} - 2r_{25} + 2r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(186) &+ r_{12} - 2r_{13} + 2r_{14} - r_{15} - 2r_{24} + r_{25} + 2r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(187) &+ r_{12} - r_{13} - 2r_{14} + 2r_{15} + r_{23} - 2r_{25} - 2r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(188) &+ r_{12} - r_{13} + 2r_{14} - 2r_{15} + r_{23} - 2r_{24} + 2r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(189) &+ r_{12} - 2r_{14} + r_{15} - 2r_{23} + 2r_{24} - r_{25} + 2r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(190) &+ r_{12} + r_{14} - 2r_{15} - 2r_{23} - r_{24} + 2r_{25} - 2r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(191) &+ r_{12} + r_{13} - 2r_{14} - r_{23} + 2r_{24} - 2r_{25} + 2r_{34} - 2r_{35} + 2r_{45} \leq 3 \\
(192) &+ r_{12} + r_{13} - 2r_{15} - r_{23} - 2r_{24} + 2r_{25} - 2r_{34} + 2r_{35} + 2r_{45} \leq 3 \\
(193) &+ r_{12} + 2r_{13} - 2r_{14} - r_{15} - 2r_{23} + r_{25} + 2r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(194) &+ r_{12} + 2r_{13} - r_{14} - 2r_{15} - 2r_{23} + r_{24} + 2r_{34} + 2r_{35} - 2r_{45} \leq 3 \\
(195) &+ 2r_{12} - 2r_{13} - 2r_{14} + 2r_{23} + 2r_{24} - 2r_{25} - r_{34} + r_{35} + r_{45} \leq 3 \\
(196) &+ 2r_{12} - 2r_{13} - r_{14} + r_{15} + 2r_{23} + 2r_{24} - 2r_{25} - 2r_{34} + r_{45} \leq 3 \\
(197) &+ 2r_{12} - 2r_{13} - 2r_{15} + 2r_{23} - 2r_{24} + 2r_{25} + r_{34} - r_{35} + r_{45} \leq 3 \\
(198) &+ 2r_{12} - 2r_{13} + r_{14} - r_{15} + 2r_{23} - 2r_{24} + 2r_{25} - 2r_{35} + r_{45} \leq 3 \\
(199) &+ 2r_{12} - 2r_{13} + 2r_{14} + 2r_{15} - 2r_{24} - 2r_{25} + r_{34} + r_{35} - r_{45} \leq 3 \\
(200) &+ 2r_{12} - 2r_{13} + 2r_{14} + 2r_{15} + r_{23} - 2r_{24} - r_{25} + r_{35} - 2r_{45} \leq 3 \\
(201) &+ 2r_{12} - 2r_{13} + 2r_{14} + 2r_{15} + r_{23} - r_{24} - 2r_{25} + r_{34} - 2r_{45} \leq 3 \\
(202) &+ 2r_{12} - r_{13} - 2r_{14} + r_{15} + 2r_{23} + 2r_{24} - 2r_{25} - 2r_{34} + r_{35} \leq 3 \\
(203) &+ 2r_{12} - r_{13} + r_{14} - 2r_{15} + 2r_{23} - 2r_{24} + 2r_{25} + r_{34} - 2r_{35} \leq 3 \\
(204) &+ 2r_{12} - 2r_{14} - 2r_{15} - 2r_{23} + 2r_{24} + 2r_{25} + r_{34} + r_{35} - r_{45} \leq 3 \\
(205) &+ 2r_{12} + r_{13} - 2r_{14} - r_{15} - 2r_{23} + 2r_{24} + 2r_{25} + r_{35} - 2r_{45} \leq 3 \\
(206) &+ 2r_{12} + r_{13} - r_{14} - 2r_{15} - 2r_{23} + 2r_{24} + 2r_{25} + r_{34} - 2r_{45} \leq 3 \\
(207) &+ 2r_{12} + 2r_{13} - 2r_{14} + 2r_{15} - 2r_{23} - 2r_{25} + r_{34} - r_{35} + r_{45} \leq 3 \\
(208) &+ 2r_{12} + 2r_{13} - 2r_{14} + 2r_{15} - 2r_{23} + r_{24} - r_{25} - 2r_{35} + r_{45} \leq 3 \\
(209) &+ 2r_{12} + 2r_{13} - 2r_{14} + 2r_{15} - r_{23} + r_{24} - 2r_{25} + r_{34} - 2r_{35} \leq 3 \\
(210) &+ 2r_{12} + 2r_{13} + 2r_{14} - 2r_{15} - 2r_{23} - 2r_{24} - r_{34} + r_{35} + r_{45} \leq 3 \\
(211) &+ 2r_{12} + 2r_{13} + 2r_{14} - 2r_{15} - 2r_{23} - r_{24} + r_{25} - 2r_{34} + r_{45} \leq 3 \\
(212) &+ 2r_{12} + 2r_{13} + 2r_{14} - 2r_{15} - r_{23} - 2r_{24} + r_{25} - 2r_{34} + r_{35} \leq 3 \\
(213) &- 4r_{12} - 4r_{13} + 3r_{14} + 3r_{15} - 2r_{23} + 2r_{24} + 2r_{25} + 2r_{34} + 2r_{35} - r_{45} \leq 5 \\
(214) &- 4r_{12} - 2r_{13} + 2r_{14} + 2r_{15} - 4r_{23} + 3r_{24} + 3r_{25} + 2r_{34} + 2r_{35} - r_{45} \leq 5 \\
(215) &- 4r_{12} + 2r_{13} - 2r_{14} + 2r_{15} + 3r_{23} - 4r_{24} + 3r_{25} + 2r_{34} - r_{35} + 2r_{45} \leq 5 \\
(216) &- 4r_{12} + 2r_{13} + 2r_{14} - 2r_{15} + 3r_{23} + 3r_{24} - 4r_{25} - r_{34} + 2r_{35} + 2r_{45} \leq 5 \\
(217) &- 4r_{12} + 3r_{13} - 4r_{14} + 3r_{15} + 2r_{23} - 2r_{24} + 2r_{25} + 2r_{34} - r_{35} + 2r_{45} \leq 5 \\
(218) &- 4r_{12} + 3r_{13} + 3r_{14} - 4r_{15} + 2r_{23} + 2r_{24} - 2r_{25} - r_{34} + 2r_{35} + 2r_{45} \leq 5 \\
(219) &- 2r_{12} - 4r_{13} + 2r_{14} + 2r_{15} - 4r_{23} + 2r_{24} + 2r_{25} + 3r_{34} + 3r_{35} - r_{45} \leq 5 \\
(220) &- 2r_{12} + 2r_{13} - 4r_{14} + 2r_{15} + 2r_{23} - 4r_{24} + 2r_{25} + 3r_{34} - r_{35} + 3r_{45} \leq 5 \\
(221) &- 2r_{12} + 2r_{13} + 2r_{14} - 4r_{15} + 2r_{23} + 2r_{24} - 4r_{25} - r_{34} + 3r_{35} + 3r_{45} \leq 5 \\
(222) &- r_{12} + 2r_{13} + 2r_{14} + 3r_{15} + 2r_{23} + 2r_{24} + 3r_{25} - 2r_{34} - 4r_{35} - 4r_{45} \leq 5 \\
(223) &- r_{12} + 2r_{13} + 3r_{14} + 2r_{15} + 2r_{23} + 3r_{24} + 2r_{25} - 4r_{34} - 2r_{35} - 4r_{45} \leq 5 \\
(224) &- r_{12} + 3r_{13} + 2r_{14} + 2r_{15} + 3r_{23} + 2r_{24} + 2r_{25} - 4r_{34} - 4r_{35} - 2r_{45} \leq 5 \\
(225) &+ 2r_{12} - 4r_{13} - 2r_{14} + 2r_{15} + 3r_{23} + 2r_{24} - r_{25} - 4r_{34} + 3r_{35} + 2r_{45} \leq 5
\end{aligned}$$

$$\begin{aligned}
(226) + 2r_{12} - 4r_{13} + 2r_{14} - 2r_{15} + 3r_{23} - r_{24} + 2r_{25} + 3r_{34} - 4r_{35} + 2r_{45} &\leq 5 \\
(227) + 2r_{12} - 2r_{13} - 4r_{14} + 2r_{15} + 2r_{23} + 3r_{24} - r_{25} - 4r_{34} + 2r_{35} + 3r_{45} &\leq 5 \\
(228) + 2r_{12} - 2r_{13} + 2r_{14} - 4r_{15} + 2r_{23} - r_{24} + 3r_{25} + 2r_{34} - 4r_{35} + 3r_{45} &\leq 5 \\
(229) + 2r_{12} - r_{13} + 2r_{14} + 3r_{15} + 2r_{23} - 2r_{24} - 4r_{25} + 2r_{34} + 3r_{35} - 4r_{45} &\leq 5 \\
(230) + 2r_{12} - r_{13} + 3r_{14} + 2r_{15} + 2r_{23} - 4r_{24} - 2r_{25} + 3r_{34} + 2r_{35} - 4r_{45} &\leq 5 \\
(231) + 2r_{12} + 2r_{13} - 4r_{14} - 2r_{15} - r_{23} + 3r_{24} + 2r_{25} + 3r_{34} + 2r_{35} - 4r_{45} &\leq 5 \\
(232) + 2r_{12} + 2r_{13} - 2r_{14} - 4r_{15} - r_{23} + 2r_{24} + 3r_{25} + 2r_{34} + 3r_{35} - 4r_{45} &\leq 5 \\
(233) + 2r_{12} + 2r_{13} - r_{14} + 3r_{15} - 2r_{23} + 2r_{24} - 4r_{25} + 2r_{34} - 4r_{35} + 3r_{45} &\leq 5 \\
(234) + 2r_{12} + 2r_{13} + 3r_{14} - r_{15} - 2r_{23} - 4r_{24} + 2r_{25} - 4r_{34} + 2r_{35} + 3r_{45} &\leq 5 \\
(235) + 2r_{12} + 3r_{13} - r_{14} + 2r_{15} - 4r_{23} + 2r_{24} - 2r_{25} + 3r_{34} - 4r_{35} + 2r_{45} &\leq 5 \\
(236) + 2r_{12} + 3r_{13} + 2r_{14} - r_{15} - 4r_{23} - 2r_{24} + 2r_{25} - 4r_{34} + 3r_{35} + 2r_{45} &\leq 5 \\
(237) + 3r_{12} - 4r_{13} - 4r_{14} + 3r_{15} + 2r_{23} + 2r_{24} - r_{25} - 2r_{34} + 2r_{35} + 2r_{45} &\leq 5 \\
(238) + 3r_{12} - 4r_{13} + 3r_{14} - 4r_{15} + 2r_{23} - r_{24} + 2r_{25} + 2r_{34} - 2r_{35} + 2r_{45} &\leq 5 \\
(239) + 3r_{12} - r_{13} + 2r_{14} + 2r_{15} + 3r_{23} - 4r_{24} - 4r_{25} + 2r_{34} + 2r_{35} - 2r_{45} &\leq 5 \\
(240) + 3r_{12} + 2r_{13} - r_{14} + 2r_{15} - 4r_{23} + 3r_{24} - 4r_{25} + 2r_{34} - 2r_{35} + 2r_{45} &\leq 5 \\
(241) + 3r_{12} + 2r_{13} + 2r_{14} - r_{15} - 4r_{23} - 4r_{24} + 3r_{25} - 2r_{34} + 2r_{35} + 2r_{45} &\leq 5 \\
(242) + 3r_{12} + 3r_{13} - 4r_{14} - 4r_{15} - r_{23} + 2r_{24} + 2r_{25} + 2r_{34} + 2r_{35} - 2r_{45} &\leq 5
\end{aligned}$$

4 Violations Found

4.1 Equation 61

4.1.1 Qquarts

$$h^{(61)}(\vec{r}) = 1.075 > 1 \quad (1)$$

$$h^{(61)}(\vec{r}) = 1.086 > 1$$

$$h^{(61)}(\vec{r}) = 1.121 > 1$$

Violation vectors described below:

—————RESULTS—————

VIOLATION: 1.0754019554219685

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```

[[-0.12817448-5.57500335e-01j]
 [ 0.52442739+4.31517620e-01j]
 [-0.25040714-4.28057640e-02j]
 [ 0.38340196-3.08489359e-05j]]

```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```
Qobj data =  
[[ 0.42776137-0.50662413j]  
 [-0.26778893-0.50607765j]  
 [-0.06482366-0.40834675j]  
 [-0.23069972+0.09140653j]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[0.28109578+0.02573968j]  
 [0.00909165+0.30688945j]  
 [0.13306824+0.53685038j]  
 [0.09873862-0.71441866j]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[-0.052766 -0.21607793j]  
 [-0.11014431-0.31974875j]  
 [ 0.40221757+0.54512052j]  
 [ 0.29238467+0.54012119j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[ 0.5852526 -0.17042729j]  
 [-0.16938774+0.05387066j]  
 [ 0.19504296-0.46245529j]  
 [-0.57556574+0.11686363j]]
```

RESULTS

VIOLATION: 1.0862544116835398

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.32413536+3.54279863e-04j]
 [0.65703538+6.80617848e-01j]
 [0.          +0.00000000e+00j]
 [0.          +0.00000000e+00j]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.04431575+0.22414866j]
 [0.10967808+0.40797778j]
 [0.50097776+0.71995807j]
 [0.          +0.j          ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.03595804+0.0178846j ]
 [ 0.20980974-0.06515221j]
 [-0.17903376+0.0413379j ]
 [ 0.95641962-0.04027196j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.43052831+0.41894617j]
 [-0.6940286  +0.23342501j]
 [-0.27759122-0.12829305j]
 [-0.06637499-0.07102767j]]
```

———— Run time is 400.10449171066284 seconds ————

———— RESULTS ————

VIOLATION: 1.1211270593566915

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.06498155+0.18066721j]
 [0.72297902+0.6636551j ]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.21295788+0.40816413j]
 [0.27294776+0.19372662j]
 [0.56950418+0.59303076j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.1087095 +0.03212068j]
  [-0.20256671+0.03670142j]
  [-0.43417903+0.06514104j]
  [ 0.83227922-0.24357086j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[-0.40304892+0.1737301j ]
 [-0.15414331+0.55074093j]
 [-0.29296711+0.60278243j]
 [ 0.00067918-0.17639968j]]
```

———— Run time is 523.2478084564209 seconds ————

4.2 Equation 62

4.2.1 Qquarts

$$h^{(62)}(\vec{r}) = 1.138 > 1 \quad (2)$$

$$h^{(62)}(\vec{r}) = 1.02 > 1$$

Violation vectors described below:

———— RESULTS ————

VIOLATION: 1.1383551868871626

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.18563302+0.20341776j]  
 [0.54947623+0.7888203j ]  
 [0.          +0.j       ]  
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.03393809+0.15602689j]  
 [0.05322076+0.10078311j]  
 [0.67824612+0.70816405j]  
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.64560557-0.19177438j]  
 [ 0.37379805+0.23227479j]  
 [ 0.40622849+0.24468309j]  
 [-0.33987808+0.11104491j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.32977706-0.25533729j]  
 [-0.02804839+0.10424057j]  
 [ 0.18126318+0.11265273j]  
 [-0.81517312-0.3230216j ]]
```

———— Run time is 1624.7631840705872 seconds ————

———— RESULTS ————

VIOLATION: 1.0205468366596235

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.10467657+0.0747041j ]  
 [0.46907247+0.87374661j]  
 [0.          +0.j       ]  
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.12624111+0.04533507j]  
 [0.08760532+0.29545833j]  
 [0.90975296+0.24369479j]  
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.35814205+0.00452403j]  
 [0.16089198+0.7232685j ]  
 [0.29052849+0.06338791j]  
 [0.48060773-0.05745988j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.41726975-0.03347547j]  
 [ 0.13577062+0.38877138j]  
 [-0.14152902+0.3117594j ]  
 [ 0.70862766+0.18923782j]]
```

———— Run time is 729.396223783493 seconds ————

4.3 Equation 63

4.3.1 Qquarts

$$\begin{aligned}h^{(63)}(\vec{r}) &= 1.0738 \\h^{(63)}(\vec{r}) &= 1.075 \\h^{(63)}(\vec{r}) &= 1.114 \\h^{(63)}(\vec{r}) &= 1.141 \\h^{(63)}(\vec{r}) &= 1.2431\end{aligned}\tag{3}$$

RESULTS

VIOLATION: 1.0738015971537773

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.10680289+0.07794998j]
 [0.54932185+0.8250833j ]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.39428399+0.52003044j]
 [0.27820468+0.51021367j]
 [0.47954543+0.08017998j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.25550742-0.0148801j ]
 [-0.26093206+0.10660523j]
 [ 0.39432908+0.49388876j]
```

```
[-0.32069398-0.59395132j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.08935085-0.28848103j]
 [ 0.03467703-0.4342063j ]
 [-0.30421837-0.52543736j]
 [-0.02002859-0.59162753j]]
```

Run time is 12.248440265655518 seconds

RESULTS

VIOLATION: 1.0750178388422755

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.07938679+0.19564104j]
 [0.37109623+0.90427314j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.4530133 +0.34362969j]
 [0.05088007+0.51727785j]
 [0.34029974+0.53919247j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.13944497+0.06639181j]
 [ 0.17498796-0.06519215j]
```

```
[ 0.41475075-0.00235308j]
[-0.59736581+0.64218906j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.00228229+0.33283417j]
 [-0.39505817+0.03873478j]
 [-0.03298337+0.83915978j]
 [ 0.1606844 +0.02341674j]]
```

Run time is 178.73766613006592 seconds

RESULTS

VIOLATION: 1.1148907226950944

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.21836402+0.60994437j]
 [0.76080285+0.03826273j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.34205716+0.7513843j ]
 [0.43834517+0.26099429j]
 [0.16006922+0.18036597j]
 [0.          +0.j       ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.17307413-0.16799952j]
```

```
[ -0.06789638 -0.06092694j ]  
[ -0.76614137 +0.41234412j ]  
[  0.12616985 -0.40072483j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[-0.03120903+0.01025502j]  
 [ 0.08217659+0.0064666j ]  
 [ 0.42325227+0.23114071j]  
 [ 0.82849314-0.27047484j ]]
```

———— Run time is 276.44089674949646 seconds ————

———— RESULTS ————

VIOLATION: 1.141196557463855

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.37786828+0.13047002j]  
 [0.7849253  +0.47337661j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.08301765+0.57041062j]  
 [0.45118197+0.11189091j]  
 [0.24993734+0.62384804j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.07224107+0.0075583j ]  
 [ -0.27321525-0.01174483j ]  
 [ -0.77979616-0.28493442j ]  
 [ -0.47092292+0.09434789j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.00641401+0.35510159j ]  
 [  0.24803562-0.1295212j ]  
 [  0.39349174+0.54783187j ]  
 [ -0.5420669  -0.21626901j ]]
```

———— Run time is 410.5380654335022 seconds ————

———— RESULTS ————

VIOLATION: 1.243102019809755

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 1.]  
 [ 0.]  
 [ 0.]  
 [ 0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.10054763+0.26919552j ]  
 [ 0.45351101+0.84365379j ]  
 [ 0.          +0.j          ]  
 [ 0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.45489167+0.3138663j ]  
 [ 0.74489277+0.12519127j ]  
 [ 0.11266085+0.33366295j ]  
 [ 0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```

Qobj data =
[[ -0.28787651-0.02565707j ]
 [ -0.16274816+0.09187821j ]
 [ -0.41793173-0.3922415j  ]
 [ -0.57840475-0.46740548j ]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 0.17345512+0.02461059j ]
 [ 0.23039465-0.24167635j ]
 [ 0.57303741+0.32622222j ]
 [-0.47701992-0.44212857j ]]

```

———— Run time is 511.78956747055054 seconds ————

4.4 Equation 64

4.4.1 Qquarts

$$h^{(64)}(\vec{r}) = 1.085$$

$$h^{(64)}(\vec{r}) = 1.097$$

$$h^{(64)}(\vec{r}) = 1.115$$

$$h^{(64)}(\vec{r}) = 1.138$$

$$h^{(64)}(\vec{r}) = 1.167$$

(4)

RESULTS

VIOLATION: 1.08556509160992

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[ 1.]
 [ 0.]
 [ 0.]
 [ 0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.28684057+0.63419478j]
 [0.67263513+0.25116019j]
 [0.          +0.j        ]
 [0.          +0.j        ]

```

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.19702499+0.2487409j ]
 [0.27682858+0.53484311j]
 [0.69085304+0.24359798j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.07035495-0.05021755j]
 [ -0.03270957-0.56290987j]
 [  0.21184665+0.38144897j]
 [  0.00543049-0.69582981j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.14334429-0.27137051j]
  [-0.1819748  -0.49594704j]
  [ 0.31875805+0.34993378j]
  [ 0.34278843+0.53401116j]]
```

———— Run time is 2.6876626014709473 seconds ————

———— RESULTS ————

VIOLATION: 1.0972730569853901

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.57783309+0.14540219j]
 [0.75841313+0.26415271j]
```



```
[0.          +0.j          ]
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.35831725+0.1804479j ]
 [0.41041529+0.52594839j]
 [0.47599715+0.40915962j]
 [0.          +0.j          ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.25825203-0.41809855j]
 [ 0.29807173-0.44611739j]
 [-0.03225955+0.51127938j]
 [-0.40340893-0.2131806j ]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.14150516+0.16533757j]
 [-0.23906746+0.70615394j]
 [-0.10093843-0.15871906j]
 [-0.60085978-0.02050262j ]]
```

———— Run time is 80.30976438522339 seconds ————

———— RESULTS ————

VIOLATION: 1.1153479725458388

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.17893349+0.73611998j]
```

```
[0.39589741+0.5190139j ]  
[0.          +0.j       ]  
[0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.46929878+0.41858218j]  
 [0.30087861+0.18115761j]  
 [0.46051098+0.5187786j ]  
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.21906047+0.07579502j]  
 [  0.00540854+0.77636789j]  
 [  0.22045383-0.28748626j]  
 [  0.40351532+0.22230251j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.30059344+0.15674906j]  
 [-0.57090887+0.39261665j]  
 [  0.3741589  -0.09172045j]  
 [-0.21677459-0.45780979j]]
```

———— Run time is 88.83793997764587 seconds ————

———— RESULTS ————

VIOLATION: 1.1380211011138466

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.47975526+0.66992422j]
 [0.31693173+0.46967085j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.42446272+0.09592169j]
 [0.60088995+0.30987037j]
 [0.47191117+0.36172075j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.08314347-0.14246402j]
 [  0.67341845-0.05429143j]
 [-0.37943908+0.35488018j]
 [  0.12578901-0.48022324j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.34889446-0.22971176j]
 [-0.32032933-0.16208352j]
 [  0.28030337+0.35256198j]
 [  0.69904507+0.07133916j]]
```

———— Run time is 691.2967467308044 seconds ————

———— RESULTS ————

VIOLATION: 1.16039234118743

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```
Qobj data =
[[0.56692001+0.51028838j]
 [0.64492648+0.04772121j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[0.1240127 +0.43425123j]
 [0.69871567+0.00436356j]
 [0.47974859+0.2786851j ]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[-0.1976907 -0.19725177j]
 [-0.36169745-0.17050439j]
 [ 0.56616248-0.01570896j]
 [ 0.31617705+0.58425909j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[ 0.18761163-0.28063716j]
 [ 0.00368026-0.46713812j]
 [-0.41599801+0.43100125j]
 [ 0.55368404-0.04930175j]]
```

———— Run time is 746.2991712093353 seconds ————

———— RESULTS ————

VIOLATION: 1.167045700797415

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.79112332+0.29983322j]
 [0.26322073+0.46361491j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.37953387+0.05229081j]
 [0.47408151+0.36504065j]
 [0.55319614+0.43495493j]
 [0.          +0.j       ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.35279241-0.35087694j]
 [ 0.0592795  -0.55728659j]
 [ 0.05969566+0.25724664j]
 [-0.3656929  +0.48463366j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.13338458-0.04018006j]
 [0.15578304-0.64309442j]
 [0.07349636+0.50049636j]
 [0.36397903-0.39290746j]]

```

———— Run time is 932.1442246437073 seconds ————

4.5 Equation 65

4.5.1 Qquarts

$$h^{(65)}(\vec{r}) = 1.023$$

$$h^{(65)}(\vec{r}) = 1.036$$

$$h^{(65)}(\vec{r}) = 1.106$$

$$h^{(65)}(\vec{r}) = 1.107$$

$$h^{(65)}(\vec{r}) = 1.1102$$

(5)

RESULTS

VIOLATION: 1.0233654329271087

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.35976462+0.53200273j]
 [0.56195238+0.52129841j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.21619692+0.34116121j]
 [0.01388408+0.12254472j]
 [0.3673069  +0.82869994j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.19438901+0.68994563j]
 [-0.1950883  -0.31044625j]
 [ 0.16707715-0.4116811j ]
 [-0.08315122+0.38398098j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.36904121-0.42622814j]
 [-0.44014151+0.07693312j]
 [-0.10451121+0.12024569j]
 [-0.5836301  +0.34130514j]]
```

———— Run time is 452.0948567390442 seconds ————

RESULTS

VIOLATION: 1.036235832051784

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.28743585+0.55749651j]
 [0.46690435+0.62336073j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.62623156+0.4672902j ]
 [0.03170848+0.03825656j]
 [0.61986889+0.05260673j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.37255171-0.51189967j]
 [-0.17848914+0.3382537j ]
 [-0.30116731+0.4734571j ]
 [ 0.35698591-0.10289651j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.31286967-0.27573482j]
 [-0.22540253+0.1350198j ]
 [ 0.35502021+0.04688598j]
 [ 0.48306707+0.62885196j]]
```

Run time is 506.9160158634186 seconds

RESULTS

VIOLATION: 1.1061789657321355

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.59483323+0.59746995j]
 [0.5271696 +0.10627939j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.51719517+0.03834098j]
 [0.09518724+0.26824676j]
 [0.58149402+0.55846835j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.26752481-0.65917227j]
 [ 0.00516723+0.49028542j]
 [-0.32118873-0.0590396j ]
 [-0.08532135-0.37361516j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.02109482+0.38629604j]
 [ 0.06848364-0.01825667j]
 [ 0.34222039-0.27176291j]
```

$[-0.75903242 - 0.27965509j]$

Run time is 572.5788474082947 seconds

RESULTS

VIOLATION: 1.1076928288176509

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.44918313 + 0.15393823j \\ 0.68526323 + 0.55222444j \\ 0. + 0.j \\ 0. + 0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.48905698 + 0.54012618j \\ 0.11316097 + 0.01049929j \\ 0.40169452 + 0.54296671j \\ 0. + 0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.448042 & -0.69454055j \\ 0.1693251 & +0.36430132j \\ 0.26067844 & +0.05234332j \\ 0.23191156 & -0.1760946j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.39574432 - 0.47570248j \\ -0.04863739 + 0.26925887j \end{bmatrix}$

```
[ 0.11684574+0.45717151j]
[-0.40293356+0.39650155j]]
```

Run time is 3060.9914565086365 seconds

RESULTS

VIOLATION: 1.1102083111329826

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.89945768+0.20177787j]
 [0.00840702+0.38754471j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.19485207+0.49161245j]
 [0.17200663+0.26608053j]
 [0.5311617  +0.58123316j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.06010757-0.18003002j]
 [-0.16948481-0.24937248j]
 [ 0.1089082  +0.16974828j]
 [ 0.40385635-0.81810092j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.59560369+0.21051818j]
```

```
[ 0.43717622+0.3152999j ]
[ 0.15475262-0.31102584j ]
[ 0.37038465-0.22919649j ]]
```

———— Run time is 7227.017312049866 seconds ————

4.6 Equation 66

4.6.1 Qbits

$$\begin{aligned} h^{(66)}(\vec{r}) &= 2.2489 > 2 \\ h^{(66)}(\vec{r}) &= 2.2498 > 2 \end{aligned} \tag{6}$$

———— RESULTS ————

VIOLATION: 2.2489181443638313

This is vector A:
Quantum object: dims = [[1], [2]], shape = (1, 2), type = bra
Qobj data =
[[1. 0.]]

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.72689466-0.5261009j]
[-0.25668669+0.35910158j]]

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.27773879-0.09470185j]
[-0.63584916-0.71385472j]]

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.63487515-0.33123119j]
[-0.45414872+0.53006451j]]

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.43433008-0.83989294j]]

$[-0.04498408+0.32235644j]$

Run time is 190.94692754745483 seconds

RESULTS

VIOLATION: 2.24982707296016

This is vector A:

Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra

Qobj data =

$[[1. \ 0.]]$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[-0.06399917+0.2396887j]$
 $[-0.79665938-0.551169j]]$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[-0.79386256+0.31083327j]$
 $[\ 0.51878777+0.06343627j]]$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[-0.85647988-0.49808094j]$
 $[-0.03710167+0.13031143j]]$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[\ 0.5230364 \ +0.1887727j]$
 $[-0.83114211-0.00076821j]]$

Run time is 1887.3052780628204 seconds

4.6.2 Qtrits

$$h^{(66)}(\vec{r}) = 2.124 > 2$$

$$h^{(66)}(\vec{r}) = 2.149 > 2$$

$$h^{(66)}(\vec{r}) = 2.175 > 2$$

$$\begin{aligned}
h^{(66)}(\vec{r}) &= 2.1929 > 2 \\
h^{(66)}(\vec{r}) &= 2.195 > 2 \\
h^{(66)}(\vec{r}) &= 2.1999 > 2 \\
h^{(66)}(\vec{r}) &= 2.246 > 2
\end{aligned} \tag{7}$$

RESULTS

VIOLATION: 2.124833012502746

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.4731401 + 0.54208078j \\ 0.50904081 + 0.47240272j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.31176713 - 0.13157187j \\ -0.40849208 - 0.41755518j \\ -0.32862413 + 0.66051357j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.6563377 - 0.065509j \\ 0.62405654 - 0.13911471j \\ -0.05422839 - 0.39139393j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.64773408 + 0.53500579j \\ 0.408094 + 0.25526102j \\ -0.05707217 + 0.24341987j \end{bmatrix}$

———— Run time is 2.5282363891601562 seconds ————

———— RESULTS ————

VIOLATION: 2.1492510314450826

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.15073006+0.25459479j \\ 0.30686438+0.90459725j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.01265355-0.0008641j \\ -0.34247636-0.06148357j \\ 0.90380373-0.24881253j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.57628125+0.2131223j \\ -0.00493043-0.36536439j \\ 0.28121659+0.64021917j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.37807681+0.3881068j \\ -0.07152161+0.83178221j \\ -0.09677736-0.00939157j \end{bmatrix}$

———— Run time is 5.640021562576294 seconds ————

———— RESULTS ————

VIOLATION: 2.149558012055068

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.22389337+0.50870857j \\ 0.59229936+0.58332565j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.15336299+0.46977612j \\ -0.39358924+0.23655159j \\ -0.28852615+0.67946575j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.86020732-0.34378422j \\ -0.2864095 +0.02611877j \\ 0.16407361-0.17950776j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.15487691+0.70405587j \\ -0.25828651+0.22340485j \\ -0.11055656+0.59285249j \end{bmatrix}$

———— Run time is 7.0163893699646 seconds ————

———— RESULTS ————

VIOLATION: 2.1750974321169263

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.07050412+0.68786412j]
 [0.36983787+0.62055787j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.04799855-0.14762762j]
 [-0.02049408-0.27939111j]
 [-0.41530548-0.85143654j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.22969675+0.57017646j]
 [-0.05527547+0.47289466j]
 [ 0.37354924+0.50587986j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.70292586-0.53347713j]
 [ 0.22661601-0.19638581j]
 [-0.25979824+0.25274505j]]
```

———— Run time is 17.42153573036194 seconds ————

———— RESULTS ————

VIOLATION: 2.192989915319071

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
```


[0.]

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.49338429+0.13804895j \\ 0.35141041+0.78359757j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.28455816+0.08787279j \\ 0.75552931+0.41649983j \\ -0.30927017-0.26713354j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.14146465-0.33149743j \\ 0.75921691-0.49073626j \\ -0.22946666-0.01448646j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.82227216+0.3364908j \\ -0.33002871+0.26282292j \\ -0.0230084 -0.17921556j \end{bmatrix}$

———— Run time is 265.64613461494446 seconds ————

———— RESULTS ————

VIOLATION: 2.1953268976083975

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.56391684+0.29788794j]
 [0.54889158+0.54035045j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.02188954-0.03476425j]
 [0.58325271+0.33691059j]
 [0.68433337-0.27623842j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.40028742+0.54445119j]
 [-0.24680755+0.57920402j]
 [ 0.22782192+0.30829983j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.5087605+0.55448149j]
 [ 0.077856 +0.45710137j]
 [ 0.4623941+0.07001074j]]
```

———— Run time is 291.59683752059937 seconds ————

———— RESULTS ————

VIOLATION: 2.19992269778047

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.67465708+0.01825862j]
 [0.52498818+0.51854784j]]
```

```
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.10017974-0.42216204j]
 [ 0.55479845+0.12072328j]
 [-0.68616726+0.1361701j ]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.70568131+0.3192214j ]
 [-0.36655041+0.31882632j]
 [ 0.39471913-0.09109869j ]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.54256159-0.74203068j]
 [ 0.31194377-0.08572423j]
 [-0.1619654  +0.15532884j ]]
```

———— Run time is 377.9440190792084 seconds ————

———— RESULTS ————

VIOLATION: 2.2467145962742463

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.65980152+0.25585866j]
 [0.347712  +0.61505663j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.23218478-0.0703414j \\ 0.48477614+0.48125454j \\ 0.56446304+0.39485434j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.37984579-0.80460675j \\ 0.24899374+0.27588184j \\ -0.07980093+0.25268219j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.63482213-0.15218684j \\ -0.59984221-0.03561601j \\ -0.4120307 +0.20734404j \end{bmatrix}$

———— Run time is 457.93143343925476 seconds ————

4.6.3 Qquarts

$$h^{(66)}(\vec{r}) = 2.047 > 2$$

$$h^{(66)}(\vec{r}) = 2.098 > 2$$

$$h^{(66)}(\vec{r}) = 2.2682 > 2$$

(8)

RESULTS

VIOLATION: 2.0475313692430372

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.31774751+0.55904748j \end{bmatrix}$

```
[0.70009756+0.31042849j]
[0.          +0.j      ]
[0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.08226089+0.1440365j ]
 [0.16339978+0.36698627j]
 [0.68364104+0.58629613j]
 [0.          +0.j      ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.50307371+0.23183594j]
  [ 0.6210881  -0.02998188j]
  [ 0.45381343-0.29228314j]
  [-0.00655555+0.12288433j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.73784723+0.32396847j]
  [-0.0994369  -0.23245703j]
  [ 0.09444299+0.46423125j]
  [-0.0289744  -0.24785536j]]
```

———— Run time is 37.61401391029358 seconds ————

———— RESULTS ————

VIOLATION: 2.0989348978633613

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.49663981+0.45281165j]
 [0.1066836 +0.73275447j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.08314551+0.05686328j]
 [0.0496105 +0.43179707j]
 [0.62381124+0.64171879j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.33485792-0.76892044j]
 [ -0.30620448-0.37040124j]
 [  0.00746274+0.14620264j]
 [ -0.08431931-0.19269826j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.12079083-0.41834651j]
 [  0.4825387 -0.07245152j]
 [  0.45155979-0.59580614j]
 [  0.11298379+0.0254246j ]]
```

———— Run time is 65.10183811187744 seconds ————

———— RESULTS ————

VIOLATION: 2.26829408031712

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```

Qobj data =
[[0.0101828 +0.27466034j]
 [0.53008834+0.8021623j ]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.1544074 +0.26802772j]
 [0.48684451+0.35684282j]
 [0.60666543+0.41463499j]
 [0.          +0.j       ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.82849841+0.31139456j]
 [-0.15865103+0.36741982j]
 [-0.20358425+0.02313428j]
 [-0.04837154+0.11015803j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.22309823+0.21351267j]
 [-0.5743334 +0.63334976j]
 [-0.2532752 +0.32747537j]
 [ 0.02177331-0.04226371j]]

```

———— Run time is 565.3871736526489 seconds ————

4.7 Equation 67

4.7.1 Qbits

$$h^{(67)}(\vec{r}) = 2.24998 > 2 \quad (9)$$

VIOLATION: 2.249981641189778

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.80509262+0.13080292j \\ -0.56679995+0.11599266j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.43339154-0.75621778j \\ 0.33462309+0.35823711j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.39788258-0.39928396j \\ 0.55665148-0.61024659j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.85059094-0.03795993j \\ 0.52335133+0.03402173j \end{bmatrix}$

———— Run time is 21174.836371183395 seconds ————

4.7.2 Qtrits

$$h^{(67)}(\vec{r}) = 2.28804 > 2 \quad (10)$$

———— RESULTS ————

VIOLATION: 2.2880418284557043

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[0.31287041+0.36328751j]
 [0.8019739 +0.35633152j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.68842118+0.46114498j]
 [-0.38940193-0.19885954j]
 [ 0.33574929+0.09754492j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.03315566+0.69399766j]
 [-0.2488985 +0.09165708j]
 [ 0.63312212-0.21464587j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.71265934+0.4190984j ]
 [0.46709243-0.17111474j]
 [0.01326125-0.26237711j]]
```

———— Run time is 3818.1035504341125 seconds ————

4.7.3 Qquarts

$$h^{(67)}(\vec{r}) = 2.28816 > 2 \quad (11)$$

———— RESULTS ————

VIOLATION: 2.2881699367942865

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```

Qobj data =
[[0.32352521+0.15155251j]
 [0.40568073+0.84130044j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[0.4442512 +0.67325185j]
 [0.22911859+0.5311659j ]
 [0.12069159+0.01318414j]
 [0.          +0.j       ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.27933336-0.03533211j]
 [ 0.11067081-0.4165266j ]
 [-0.25271606+0.25205622j]
 [-0.72407357-0.2886205j ]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.4018676 +0.16760782j]
 [ 0.25322532-0.56525165j]
 [-0.15244248+0.19412496j]
 [-0.55918648-0.23057501j]]

```

———— Run time is 134.0863618850708 seconds ————

———— Run time is 19499.866060733795 seconds ————

4.8 Equation 68

4.8.1 Qbits

$$h^{(68)}(\vec{r}) = 2.24985 > 2 \quad (12)$$

———— RESULTS ————

VIOLATION: 2.2498585710190464

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.31737021-0.43279788j]  
 [-0.01496505-0.84364577j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.35974997-0.78090979j]  
 [ 0.04919595-0.50827121j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.04310131-0.49845409j]  
 [ 0.34708643+0.79323187j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.43701114+0.14563086j]  
 [-0.88416176-0.07791591j]]
```

———— Run time is 2438.6696116924286 seconds ————

4.8.2 Qtrits

$$h^{(68)}(\vec{r}) = 2.3043 > 2 \quad (13)$$

———— RESULTS ————

VIOLATION: 2.3043583893986828

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.29743172+0.46318591j \\ 0.57062427+0.60941047j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.66200073-0.58810474j \\ 0.34350339-0.14008918j \\ 0.27339999-0.05933576j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.15351241-0.45125749j \\ -0.42559703-0.57268344j \\ -0.5131866 +0.01846526j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.24158529+0.08975615j \\ 0.2155969 +0.41874581j \\ 0.83443387+0.12438014j \end{bmatrix}$

———— Run time is 328.62200379371643 seconds ————

4.8.3 Qquarts

$$h^{(68)}(\vec{r}) = 2.20339 > 2 \quad (14)$$

———— RESULTS ————

VIOLATION: 2.203399638552772

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.19568342+0.48124026j]
 [0.56673268+0.63947626j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.60097702+0.12156401j]
 [0.68859568+0.36084766j]
 [0.08296823+0.11309305j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[-0.11692257-0.76221886j]
 [-0.25494465+0.00826819j]
 [-0.30187259-0.20269613j]
 [-0.2720974  +0.36611011j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[-0.38452034+0.08617114j]
 [ 0.05223069-0.12974991j]
 [ 0.2894      -0.59941332j]
 [-0.5302528  -0.31770873j]]
```

———— Run time is 1593.2048518657684 seconds ————

4.9 Equation 69

4.9.1 Qbits

$$h^{(69)}(\vec{r}) = 2.2496 > 2 \quad (15)$$

———— RESULTS ————

VIOLATION: 2.249619989835261

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.26212816+0.71240406j]
 [0.42481924-0.49325236j]]
```

```
This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.24114157+0.79702396j]
 [-0.53493644+0.14299148j]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.71792303-0.42646853j]
 [-0.21574739+0.50612665j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.82094217+0.04613807j]
 [ 0.21034694+0.52884723j]]
```

———— Run time is 697.4981973171234 seconds ————

4.9.2 Qtrits

$$h^{(69)}(\vec{r}) = 2.313041 > 2 \quad (16)$$

———— RESULTS ————

VIOLATION: 2.313041833188088

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.33341816+0.34077104j]
 [0.46571649+0.7455304j ]
 [0.          +0.j       ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.14994024-0.66831809j]
 [-0.41833557-0.52011973j]
 [ 0.2298273  +0.18033052j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.38413647-0.50080457j]
 [ 0.72603965-0.21264206j]
 [ 0.16406746+0.0486375j ]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.35332587-0.77494053j]
 [-0.20152151-0.21025989j]
 [-0.40807695-0.15258134j]]

```

```

———— Run time is 1215.8998997211456 seconds ————

```

4.9.3 Qquarts

$$h^{(69)}(\vec{r}) = 2.242 > 2 \quad (17)$$

```

———— RESULTS ————

```

```

VIOLATION: 2.2428743991482682

```

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]

```

[0.]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.15761889+0.78962084j]
 [0.58360897+0.10514646j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.22069413+0.55220078j]
 [0.59906167+0.410015j   ]
 [0.08125237+0.33582626j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.51569052+0.55605992j]
 [  0.39503371+0.0595813j ]
 [-0.06301741-0.44710461j]
 [-0.21870208-0.11642494j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.29358556-0.86301001j]
 [-0.13172779-0.03133192j]
 [-0.27714582-0.06129049j]
 [-0.25181748-0.08190834j]]
```

———— Run time is 1638.6515409946442 seconds ————

4.10 Equation 70

4.10.1 Qbits

$$h^{(70)}(\vec{r}) = 2.249907 > 2 \quad (18)$$

———— RESULTS ————

VIOLATION: 2.249907061737041

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.24401295+0.95859241j \\ -0.14231001-0.03614058j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.06469905-0.72841325j \\ -0.23581446+0.6400154j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.15568535-0.15926243j \\ 0.77483114-0.59163693j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.31181433-0.00555554j \\ 0.61248595+0.72636212j \end{bmatrix}$

———— Run time is 2803.4163641929626 seconds ————

4.10.2 Qtrits

$$h^{(70)}(\vec{r}) = 2.28993 > 2 \quad (19)$$

RESULTS

VIOLATION: 2.2899355868232347

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ \end{bmatrix}$

```
[0.]  
[0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.57883951+0.34928185j]
 [0.31259051+0.66725871j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.23014457-0.12241017j]
 [0.65945298+0.6937403j]
 [0.05835248-0.11176037j]]

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.47500725-0.21076427j]
 [0.24497593+0.60008666j]
 [-0.26799545+0.48786041j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.66010992+0.36022618j]
 [-0.53741245+0.13069477j]
 [-0.3417478 -0.10866083j]]

———— Run time is 1426.6844584941864 seconds ————

4.10.3 Qquarts

$$h^{(70)}(\vec{r}) = 2.2416 > 2 \quad (20)$$

———— RESULTS ————

VIOLATION: 2.2416098518300616

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[1.]

```
[0.]  
[0.]  
[0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.63248308+0.72802195j]
 [0.05652756+0.25836761j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.06957719+0.43127762j]
 [0.43462139+0.44953317j]
 [0.52716597+0.37453817j]
 [0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.54958956+0.0952878j]
 [-0.55950185-0.166365j]
 [0.52263168+0.25513386j]
 [0.09583922-0.02701117j]]

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.53125903+0.11107568j]
 [-0.37878727+0.43785543j]
 [0.03185512+0.58841356j]
 [0.12855523-0.08035644j]]

———— Run time is 373.75968885421753 seconds ————

4.11 Equation 71

4.11.1 Qbits

$$h^{(71)}(\vec{r}) = 2.24993 > 2 \quad (21)$$

———— RESULTS ————

VIOLATION: 2.2499394981058076

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.49302587 - 0.8578845j \\ -0.06998257 - 0.12673639j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.42558047 + 0.74809137j \\ 0.5069909 + 0.04691249j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.60697238 + 0.04712508j \\ 0.69259252 - 0.38688416j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25705054 + 0.2078154j \\ 0.5364113 + 0.7765312j \end{bmatrix}$

———— Run time is 3122.758172750473 seconds ————
———— Run time is 23013.29185819626 seconds ————

4.11.2 Qtrits

$$h^{(71)}(\vec{r}) = 2.295 > 2 \quad (22)$$

———— RESULTS ————

VIOLATION: 2.2956547240910616

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.3325414 +0.83124849j]
 [0.34897532+0.27687253j]
 [0.          +0.j      ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.30959488+0.31083105j]
 [-0.41069041+0.7937996j ]
 [-0.05050144+0.07874164j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.32545305-0.14468829j]
 [ 0.21811109+0.66806367j]
 [-0.54277345+0.29096577j]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.20322875-0.05991599j]
 [ 0.30826976-0.4242522j ]
 [ 0.79212115+0.22941677j]]
```

———— Run time is 4233.582697868347 seconds ————

4.11.3 Qquarts

$$h^{(71)}(\vec{r}) = 2.2851 > 2 \quad (23)$$

———— RESULTS ————

VIOLATION: 2.285185619878367

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.66907268+0.61885658j]
 [0.15973574+0.37926611j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.53875874+0.32785281j]
 [0.18349732+0.67116197j]
 [0.1227579  +0.32101776j]
 [0.          +0.j       ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.62734967-0.10814535j]
 [ 0.40667958+0.168954j ]
 [ 0.00302458+0.55172486j]
 [-0.1490086  +0.27237879j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.07842771-0.48466496j]
 [0.20743563-0.44035669j]
 [0.35996763+0.45322928j]
 [0.37623753+0.21320708j]]
```

———— Run time is 3104.8370752334595 seconds ————

4.12 Equation 72

4.12.1 Qbits

$$h^{(72)}(\vec{r}) = 2.24997 > 2 \quad (24)$$

RESULTS

VIOLATION: 2.2499766392844815

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.79953374 - 0.24225817j \\ -0.47712574 - 0.27277793j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.59275663 - 0.16893655j \\ 0.3758841 + 0.69196183j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.21772836 - 0.94103994j \\ -0.11228277 + 0.23330404j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.01289664 + 0.50046026j \\ -0.83719231 - 0.22018682j \end{bmatrix}$

Run time is 2528.4327821731567 seconds

4.12.2 Qtrits

$$h^{(72)}(\vec{r}) = 2.3124 > 2 \quad (25)$$

RESULTS

VIOLATION: 2.312482741937252

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.6120791 + 0.39894417j \\ 0.45659331 + 0.50766651j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11091589 + 0.26719836j \\ -0.86873459 + 0.04606794j \\ 0.39922334 + 0.01006843j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.70819432 + 0.42159397j \\ -0.37495513 - 0.34448059j \\ -0.21318406 - 0.12654512j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.32159783 + 0.25744055j \\ -0.67785704 - 0.06166443j \\ 0.60072508 + 0.07833204j \end{bmatrix}$

———— Run time is 2345.2378647327423 seconds ————

4.12.3 Qquarts

$$h^{(72)}(\vec{r}) = 2.2524 > 2 \quad (26)$$

———— RESULTS ————

VIOLATION: 2.2524925998427876

```
This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.56985237+0.60684053j]
 [0.30340897+0.4636333j ]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

```
This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.24057414+0.18376185j]
 [0.65181375+0.3652597j ]
 [0.35179925+0.475728j  ]
 [0.          +0.j       ]]
```

```
This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.24843814-0.23451153j]
 [ 0.07826411+0.57597246j]
 [-0.05094813+0.73335519j]
 [-0.06399821+0.03019874j]]
```

```
This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.69713385+0.2331773j ]
 [ 0.4059974 +0.11603938j]
 [-0.46172343+0.24419829j]
 [-0.09221468+0.00297214j]]
```

———— Run time is 3113.2310287952423 seconds ————

4.13 Equation 73

4.13.1 Qbits

$$h^{(73)}(\vec{r}) = 2.24898 > 2 \quad (27)$$

————— RESULTS —————

VIOLATION: 2.2489825172854983

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.6795677 + 0.3197341j \\ 0.63940555 - 0.16467663j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.49070893 - 0.74861723j \\ 0.32357809 - 0.30671518j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.2660172 - 0.75334231j \\ -0.26412436 + 0.54032263j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.29187716 - 0.34613568j \\ 0.27109364 - 0.84941513j \end{bmatrix}$

————— Run time is 510.2023561000824 seconds —————

4.13.2 Qtrits

$$h^{(73)}(\vec{r}) = 2.29393 > 2 \quad (28)$$

RESULTS

VIOLATION: 2.2939311161446456

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.19015281+0.82933182j]  
 [0.50234946+0.15393392j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.49504601+0.53393903j]  
 [-0.22118579-0.07383148j]  
 [ 0.61105623-0.20512093j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.13054066-0.51719877j]  
 [-0.80916169-0.21898915j]  
 [ 0.04905194+0.10178207j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.27064902-0.57066826j]  
 [ 0.12503841+0.21841208j]  
 [-0.72979188-0.07177897j]]
```

Run time is 3973.4375586509705 seconds

4.13.3 Qquarts

$$h^{(73)}(\vec{r}) = 2.22166 > 2 \quad (29)$$

RESULTS

VIOLATION: 2.2216652122754996

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.05428392+0.86032628j]  
 [0.43347023+0.26266998j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.34305166+0.21960969j]  
 [0.36829806+0.48504643j]  
 [0.43250364+0.52546574j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.02121735+0.18135637j]  
 [0.15178838+0.29269918j]  
 [0.47498464+0.73644781j]  
 [0.28892825-0.08063405j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.22901881+0.47650271j]  
 [-0.05873366+0.78777787j]  
 [-0.11638341+0.07432488j]  
 [-0.27617904-0.03328326j]]
```

Run time is 546.3907527923584 seconds

4.14 Equation 74

4.14.1 Qubits

$$h^{(74)}(\vec{r}) = 2.24989 > 2 \quad (30)$$

————— RESULTS —————

VIOLATION: 2.2498923594255387

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.43713579+0.64905213j \\ -0.22879337+0.57904856j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.5217662 +0.68965556j \\ -0.38806625-0.31865316j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.29262463-0.72231049j \\ 0.58601943-0.22185495j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.27961031+0.81247615j \\ 0.27459247-0.43162432j \end{bmatrix}$

————— Run time is 205.90092182159424 seconds —————

4.14.2 Qutrits

$$h^{(74)}(\vec{r}) = 2.26059 > 2 \quad (31)$$

RESULTS

VIOLATION: 2.2605960010016783

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.54856049+0.59783415j]  
 [0.36000958+0.4605093j ]  
 [0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.34772231+0.11046495j]  
 [ 0.71098203-0.22134196j]  
 [-0.55564855-0.06044561j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.36968486-0.30017913j]  
 [-0.6853232  +0.05019191j]  
 [ 0.45424891+0.30772783j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.26405752+0.85425121j]  
 [0.27149331-0.08234986j]  
 [0.05080895-0.34271975j]]
```

Run time is 158.1709544658661 seconds

4.14.3 Qquarts

$$h^{(74)}(\vec{r}) = 2.1857 > 2 \quad (32)$$

RESULTS

VIOLATION: 2.185707246294575

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.68254259+0.71747311j]
 [0.12337986+0.06438445j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.72337589+0.09022179j]
 [0.52558553+0.15110703j]
 [0.11856616+0.39427899j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.4288949 -0.69457115j]
 [ 0.02875133-0.35330374j]
 [ 0.39166753+0.01785294j]
 [-0.12312727+0.19770534j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.66615131-0.31645401j]
 [ 0.28010617+0.12145612j]
 [-0.17038155-0.33755101j]
 [ 0.45815697+0.10004934j]]
```

Run time is 155.56772255897522 seconds

4.15 Equation 75

4.15.1 Qbits

$$h^{(75)}(\vec{r}) = 2.24995 > 2 \quad (33)$$

————— RESULTS —————

VIOLATION: 2.249953264058115

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.30685316+0.77905786j \\ 0.03880427+0.54534779j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.51097387+0.81711138j \\ -0.0257376 +0.26565444j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.54188152-0.62498025j \\ -0.54291986+0.14492113j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.83477715+0.34664011j \\ -0.10987814+0.41341812j \end{bmatrix}$

————— Run time is 1019.6091949939728 seconds —————

4.15.2 Qtrits

$$h^{(75)}(\vec{r}) = 2.3070 > 2 \quad (34)$$

RESULTS

VIOLATION: 2.3070609891955405

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.59349846+0.0669479j ]  
 [0.02038296+0.80178681j]  
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.23695034+0.84635399j ]  
 [  0.09846473+0.20528903j ]  
 [  0.41780114-0.03380499j ]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[  0.77595782-0.09860236j ]  
 [-0.08854561+0.11995278j ]  
 [  0.54491042+0.26269882j ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[  0.34053791+0.53450258j ]  
 [-0.5261889  +0.42133813j ]  
 [  0.30471259+0.22603224j ]]
```

Run time is 1490.9629247188568 seconds

4.15.3 Qquarts

$$h^{(75)}(\vec{r}) = 2.20905 > 2 \quad (35)$$

RESULTS

VIOLATION: 2.209056001126679

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.66676015+0.65199946j]
 [0.13338591+0.33546359j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.20824496+0.64603458j]
 [0.15067976+0.0494754j ]
 [0.1473189  +0.70172523j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.28892429-0.04431323j]
 [-0.65979197-0.53128159j]
 [-0.43150514-0.07334807j]
 [ 0.05653451-0.04691201j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.51966125+0.08445182j]
 [-0.58013204+0.05267537j]
 [-0.57453795+0.18047738j]
 [-0.05169213+0.13473744j]]
```

Run time is 351.40896368026733 seconds

4.16 Equation 76

4.16.1 Qbits

$$\begin{aligned}h^{(76)}(\vec{r}) &= 2.20 > 2 \\h^{(76)}(\vec{r}) &= 2.28 > 2 \\h^{(76)}(\vec{r}) &= 2.32 > 2 \\h^{(76)}(\vec{r}) &= 2.38 > 2 \\h^{(76)}(\vec{r}) &= 2.48 > 2 \\h^{(76)}(\vec{r}) &= 2.64 > 2 \\h^{(76)}(\vec{r}) &= 2.69 > 2\end{aligned}\tag{36}$$

RESULTS

VIOLATION: 2.2021586683059517

This is vector A:

Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra
Qobj data =
 $[[1. \ 0.]]$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[0.64369666+0.26186833j]$
 $[0.03590097-0.7181857j]]$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[\ 0.52780921+0.20343006j]$
 $[-0.79881481+0.20476459j]]$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.32380496-0.65434767j]$
 $[\ 0.59630356-0.33376867j]]$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.43595923+0.77737192j]$

[0.32078874+0.32051057j]]

Run time is 1.1818604469299316 seconds

RESULTS

VIOLATION: 2.2818940785494206

This is vector A:

Quantum object: dims = [[1], [2]], shape = (1, 2), type = bra

Qobj data =

[[1. 0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[0.09534081-0.41348951j]
[0.89400794+0.14382751j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[0.6676437 +0.06646512j]
[-0.13181875-0.72969727j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.80621053-0.28359676j]
[-0.33837205+0.39382968j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.34760063-0.52125747j]
[0.68942989-0.36352563j]]

Run time is 2.909595012664795 seconds

RESULTS

VIOLATION: 2.3262298049343206

This is vector A:

Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra
Qobj data =
 $[[1. \ 0.]]$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[\ 0.44085557-0.38726124j]$
 $[-0.06228633-0.80733854j]]$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.23940502+0.03055202j]$
 $[\ 0.38506919+0.89077131j]]$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.02441704+0.54721649j]$
 $[-0.61887283-0.56298699j]]$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.94403012-0.20361308j]$
 $[-0.25933824+0.00961942j]]$

———— Run time is 6.269345760345459 seconds ————

———— RESULTS ————

VIOLATION: 2.3845534551530636

This is vector A:
Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra
Qobj data =
 $[[1. \ 0.]]$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.56390191-0.21607493j]$
 $[-0.04452323-0.79582909j]]$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.23556237-0.10474248j \\ -0.83625659+0.48395692j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.54963878+0.35001038j \\ 0.54813617+0.52434405j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.37984526+0.85789663j \\ -0.28460086+0.19680777j \end{bmatrix}$

———— Run time is 13.271857500076294 seconds ————

———— RESULTS ————

VIOLATION: 2.485040546292339

This is vector A:
Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra
Qobj data =
 $\begin{bmatrix} 1. & 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.2369364 +0.12534984j \\ -0.18824153-0.94483527j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.17603899-0.42459391j \\ -0.40741115-0.78914285j \end{bmatrix}$

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.40297175+0.67026194j]
 [ 0.13876142+0.60754257j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.12520737-0.61134116j]
 [ 0.78068314+0.03345068j]]
```

———— Run time is 14.974524021148682 seconds ————

———— RESULTS ————

VIOLATION: 2.640669272040573

This is vector A:

```
Quantum object: dims = [[1], [2]], shape = (1, 2), type = bra
Qobj data =
[[1. 0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.2367662+0.17205751j]
 [ 0.8438337-0.44975845j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.42864066+0.08503906j]
 [-0.82386194+0.36095297j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.85193003+0.01177244j]
 [0.51504141+0.09385618j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.24964163-0.80950235j]
```

$[-0.31284258+0.42955153j]$

Run time is 16.497089862823486 seconds

RESULTS

VIOLATION: 2.6925416700454035

This is vector A:

Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra
Qobj data =
 $[[1. \ 0.]]$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[\ 0.32066047-0.23062148j]$
 $[-0.55592537-0.73139427j]]$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.31329316-0.07344832j]$
 $[\ 0.59074262-0.73991614j]]$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.18468854+0.76490489j]$
 $[-0.61021501-0.09191454j]]$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[-0.13980147-0.75683507j]$
 $[-0.63599436-0.0562796j]]$

Run time is 178.26651287078857 seconds

4.16.2 Qtrits

$$h^{(76)}(\vec{r}) = 2.1082 > 2$$

$$h^{(76)}(\vec{r}) = 2.255 > 2$$

$$h^{(76)}(\vec{r}) = 2.258 > 2$$

$$h^{(76)}(\vec{r}) = 2.322 > 2$$

$$h^{(76)}(\vec{r}) = 2.375 > 2 \quad (37)$$

RESULTS

VIOLATION: 2.1082020308522864

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.15817614+0.03042578j \\ 0.71700731+0.6781999j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.18309036+0.09783682j \\ 0.20128688+0.87017586j \\ 0.20925846-0.33969743j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.55324053+0.81071686j \\ -0.11788086-0.02232714j \\ 0.13000417-0.07326395j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.1905983 +0.47784144j \\ 0.62826468+0.55002807j \\ -0.16263386+0.10790126j \end{bmatrix}$

Run time is 0.9305455684661865 seconds

RESULTS

VIOLATION: 2.2552800375962296

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.10579796+0.23496528j \\ 0.56540899+0.78352459j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.16902783-0.21958651j \\ -0.06450646+0.79818727j \\ -0.23329977+0.47698908j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.13292058-0.36603394j \\ -0.01822671+0.67321862j \\ -0.51587764+0.35870045j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.5482672 +0.68381289j \\ 0.154323 +0.43321708j \\ -0.05872934+0.12985086j \end{bmatrix}$

Run time is 30.158806562423706 seconds

RESULTS

VIOLATION: 2.258272497922106

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11399976+0.02105304j \\ 0.71213162+0.69240839j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.37767484-0.07320592j \\ -0.6596603 +0.46703422j \\ 0.16575801-0.41382873j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.5045947 -0.61808438j \\ -0.03295401-0.37128187j \\ 0.44335152+0.16691055j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.48660156+0.64666235j \\ -0.32165271+0.12415517j \\ 0.40646852-0.24689085j \end{bmatrix}$

———— Run time is 81.39494323730469 seconds ————

———— RESULTS ————

VIOLATION: 2.3224910639558085

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[0.27657111+0.31960116j]  
 [0.48090597+0.76817509j]  
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[ 0.0257521 +0.19847487j]  
 [ 0.82783529-0.42856271j]  
 [-0.07862776+0.29117857j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[ 0.69409854-0.38448631j]  
 [-0.32388283-0.23008507j]  
 [ 0.45920521+0.04109557j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[ 0.80388388-0.4742069j ]  
 [ 0.31780849+0.03495589j]  
 [-0.03205135-0.16014708j]]
```

———— Run time is 105.12144112586975 seconds ————

———— RESULTS ————

VIOLATION: 2.375623108872244

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.01796302+0.23755531j] \\ [0.79339623+0.56014929j] \\ [0. +0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.02672742-0.49152479j] \\ [0.70849607+0.34831965j] \\ [0.24605037-0.27176271j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.01377462+0.82352024j] \\ [-0.56256118-0.00820354j] \\ [0.05448524+0.04597459j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.74051359-0.0590171j] \\ [0.02808536-0.6166382j] \\ [0.25680814+0.03427427j] \end{bmatrix}$

———— Run time is 462.2827184200287 seconds ————

4.16.3 Qquarts

$$\begin{aligned} h^{(76)}(\vec{r}) &= 2.0474 > 2 \\ h^{(76)}(\vec{r}) &= 2.051 > 2 \end{aligned} \tag{38}$$

———— RESULTS ————

VIOLATION: 2.0474886358836004

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [1.] \\ [0.] \end{bmatrix}$

```
[0.]
[0.]]
```

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.07736385+0.39210581j]
 [0.91660999+0.0096947j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.1486739 +0.27552065j]
 [0.51817332+0.39213638j]
 [0.57153927+0.3912196j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[-0.76372333-0.50956022j]
 [-0.11531602-0.23809199j]
 [-0.20563764+0.18742708j]
 [0.01334494-0.09744555j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.45493079-0.52959489j]
 [-0.67051075-0.09715035j]
 [0.09809211+0.13318692j]
 [-0.03881994+0.15708775j]]

———— Run time is 196.76917219161987 seconds ————

———— RESULTS ————

VIOLATION: 2.0515867315033693

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[1.]

```
[0.]
[0.]
[0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.16961046+0.04353407j]
[0.92788022+0.32920414j]
[0. +0.j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.19467177+0.31830911j]
[0.3719895 +0.67044748j]
[0.47742187+0.21207207j]
[0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.30460828-0.87991289j]
[-0.12435574+0.05472064j]
[-0.18975642-0.26981097j]
[-0.03880956-0.06478246j]]

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.24100015+0.3656551j]
[-0.54927664+0.28405279j]
[0.28114787-0.41323422j]
[0.38978355+0.15519858j]]

———— Run time is 264.5076003074646 seconds ————

4.17 Equation 77

4.17.1 Qbits

$$\begin{aligned}
h^{(77)}(\vec{r}) &= 2.6344 > 2 \\
h^{(77)}(\vec{r}) &= 2.6487 > 2 \\
h^{(77)}(\vec{r}) &= 2.6563 > 2
\end{aligned} \tag{39}$$

RESULTS

VIOLATION: 2.6344667662667507

This is vector A:

Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra

Qobj data =

$[[1. \ 0.]]$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[0.00604775+0.43002382j]$
 $[0.67640801+0.5979257j]]$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[0.34488759-0.12145696j]$
 $[0.70114318+0.61212662j]]$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[-0.49826442-0.60552597j]$
 $[-0.45091699+0.4263153j]]$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$[[-0.81526992+0.14203231j]$
 $[-0.0760572 \ -0.55621677j]]$

Run time is 122.83240842819214 seconds

RESULTS

VIOLATION: 2.6487233991514842

This is vector A:

Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra

Qobj data =

$[[1. \ 0.]]$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.16359862+0.28327964j \\ -0.71052121+0.62301505j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.2637899 +0.27915095j \\ 0.71447194-0.58482432j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33453694+0.79985376j \\ -0.42288328+0.26360713j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.12439099-0.83648205j \\ -0.39746203+0.35615809j \end{bmatrix}$

———— Run time is 248.18425798416138 seconds ————

———— RESULTS ————

VIOLATION: 2.656366867007829

This is vector A:
Quantum object: dims = $[[1], [2]]$, shape = (1, 2), type = bra
Qobj data =
 $\begin{bmatrix} 1. & 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.1559142 +0.12081917j \\ -0.45754944+0.86703057j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =
 $\begin{bmatrix} -0.51012468+0.06649206j \\ -0.08502678+0.85330069j \end{bmatrix}$

This is vector D:
Quantum object: dims = $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.38135522+0.66457824j \\ -0.60161753+0.2257439j \end{bmatrix}$

This is vector E:
Quantum object: dims = $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.00066304-0.92468951j \\ -0.37836813-0.04226615j \end{bmatrix}$

———— Run time is 333.7544586658478 seconds ————

4.17.2 Qtrits

$$h^{(77)}(\vec{r}) = 2.138 > 2$$

$$h^{(77)}(\vec{r}) = 2.155 > 2$$

$$h^{(77)}(\vec{r}) = 2.286 > 2$$

$$h^{(77)}(\vec{r}) = 2.341 > 2$$

$$h^{(77)}(\vec{r}) = 2.519 > 2 \tag{40}$$

———— RESULTS ————

VIOLATION: 2.1382241029698994

This is vector A:
Quantum object: dims = $\begin{bmatrix} 3 \\ 1 \end{bmatrix}$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $\begin{bmatrix} 3 \\ 1 \end{bmatrix}$, shape = (3, 1), type = ket
Qobj data =

```
[[0.11044658+0.51869109j]
 [0.17079634+0.83041539j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.12422187+0.28333906j]
 [-0.64834086+0.39044331j]
 [ 0.341322   +0.46367591j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.4639505 -0.74585707j]
 [0.22134475-0.33195169j]
 [0.13189768+0.22773833j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.24720885+0.10912356j]
 [-0.09640448-0.36213621j]
 [-0.81229522+0.35597731j]]
```

———— Run time is 23.14417028427124 seconds ————

———— RESULTS ————

VIOLATION: 2.155905719289871

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.09855285+0.30336043j]
 [0.56356084+0.76200982j]
 [0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.42452676-0.15284919j]
 [  0.69407585+0.49904316j]
 [  0.2539993  -0.03336397j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[  0.11212024+0.79499637j]
 [  0.09863101+0.40341661j]
 [-0.10051596-0.41573229j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.42646159-0.68495994j]
 [  0.40627125+0.19007451j]
 [  0.21679401-0.31745251j]]
```

———— Run time is 23.644361972808838 seconds ————

———— RESULTS ————

VIOLATION: 2.2865803531747657

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.15917366+0.07766112j]
 [0.64024876+0.74747176j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.33518767+0.33073166j ]
 [  0.5357503  -0.24374534j ]
 [ -0.4437166  +0.48470733j ]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.49829472-0.55104463j ]
 [ -0.43601281-0.45051697j ]
 [ -0.03738376+0.23147774j ]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.67806999-0.44677331j ]
 [  0.27545705+0.21970881j ]
 [ -0.46336801+0.04190751j ]]
```

———— Run time is 172.6262285709381 seconds ————

———— RESULTS ————

VIOLATION: 2.3418704151209493

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 1.]
 [ 0.]
 [ 0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.28626431+0.24733204j ]
 [ 0.77201898+0.51075072j ]
 [ 0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.21412534+0.61577243j ]
 [  0.38165043-0.5895179j  ]
 [ -0.1272669  -0.25610423j ]]
```

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.39758082+0.65774311j \\ 0.2938914 +0.56542999j \\ 0.0299031 -0.04822929j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.85227335-0.04390843j \\ -0.44822191-0.18135584j \\ -0.19428579-0.01274325j \end{bmatrix}$

———— Run time is 741.8118057250977 seconds ————

———— RESULTS ————

VIOLATION: 2.519724970793959

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.33237622+0.00204518j \\ 0.7434404 +0.58036043j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.24981961+0.28425631j \\ 0.23679046-0.88753186j \\ -0.06140578-0.09610062j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```

[[-0.03094149+0.7646687j ]
 [-0.42114828+0.46480281j]
 [-0.13148144+0.06024535j]]

```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```

[[ 0.4693699 -0.46474565j]
 [-0.72515717-0.15511368j]
 [ 0.03699718-0.11145137j]]

```

———— Run time is 856.5812752246857 seconds ————

4.17.3 Qquarts

$$h^{(77)}(\vec{r}) = 2.023 > 2 \quad (41)$$

———— RESULTS ————

VIOLATION: 2.0234785563712196

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.03239723+0.22494629j]
 [0.69886257+0.67818927j]
 [0.          +0.j        ]
 [0.          +0.j        ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.09294074+0.09672061j]
 [0.4161836  +0.7358854j ]
 [0.04227025+0.51525165j]
 [0.          +0.j        ]]

```

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.64886476+0.6281615j \\ 0.00649628+0.33547322j \\ 0.08677532-0.0650244j \\ -0.03708244-0.24221879j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.20142458+0.40420696j \\ -0.16459093-0.02072755j \\ -0.55120162-0.2960669j \\ 0.33341862+0.51563384j \end{bmatrix}$

———— Run time is 374.4056992530823 seconds ————

4.18 Equation 78

4.18.1 Qbits

$$h^{(78)}(\vec{r}) = 2.7383 > 2 \quad (42)$$

———— RESULTS ————

VIOLATION: 2.7383964525598024

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.22572236-0.25969739j \\ 0.9389294 -0.00427402j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.55398275-0.46856218j \\ -0.67012982-0.15645643j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07601662-0.24088686j \\ -0.96736439+0.02002825j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52489633+0.59890052j \\ -0.18959413+0.57433099j \end{bmatrix}$

———— Run time is 17159.011706590652 seconds ————

4.18.2 Qtrits

$$h^{(78)}(\vec{r}) = 2.552 > 2 \quad (43)$$

———— RESULTS ————

VIOLATION: 2.5522445102861586

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.30740263+0.35748973j \\ 0.63538454+0.6115482j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.08141218-0.73441077j \\ -0.05459626+0.63747097j \\ -0.09705592-0.18773128j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.14172869+0.00399164j \\ -0.83824994-0.49950334j \\ 0.05633596-0.15670597j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.82374913+0.20538596j \\ -0.44964125+0.19014623j \\ -0.11394967+0.16714248j \end{bmatrix}$

———— Run time is 1355.1500425338745 seconds ————
———— Run time is 13097.090025663376 seconds ————

4.18.3 Qquarts

$$h^{(78)}(\vec{r}) = 2.1615735 > 2 \quad (44)$$

———— RESULTS ————

VIOLATION: 2.1615735478725684

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07531165+0.02795685j \\ 0.52630301+0.84649377j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.56658173+0.54025847j \end{bmatrix}$

```
[0.13331808+0.40938341j]
[0.28800482+0.34466021j]
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[-0.40192571+0.17601713j]
 [-0.64998675-0.25280372j]
 [-0.45320314+0.20330965j]
 [-0.25031952+0.10813616j]]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.10562007+0.6907214j ]
 [ 0.44306996-0.43154145j ]
 [-0.16218938-0.17354108j ]
 [ 0.17627022+0.20424556j ]]
```

———— Run time is 644.6650273799896 seconds ————

4.19 Equation 79

4.19.1 Qbits

$$h^{(79)}(\vec{r}) = 2.7358 > 2$$

$$h^{(79)}(\vec{r}) = 2.75586 > 2$$

$$h^{(79)}(\vec{r}) = 2.76098 > 2$$

(45)

———— RESULTS ————

VIOLATION: 2.7358488465101773

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.15855743+0.29894399j]
 [0.48242624-0.80793376j]]
```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.6703188 & -0.35028267j \\ -0.06218075 & 0.65123599j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.23993562 & -0.07272071j \\ 0.65224068 & 0.71534936j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.4865926 & 0.58497799j \\ -0.63143503 & -0.14939277j \end{bmatrix}$

———— Run time is 3004.649594068527 seconds ————

———— RESULTS ————

VIOLATION: 2.7558665840289853

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.05913921 & 0.34825849j \\ -0.57110526 & 0.74098405j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.10041174 & -0.838513j \\ 0.29818299 & -0.4448599j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.20493781-0.11169548j \\ 0.63808884+0.73373513j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.32646235-0.63127643j \\ -0.06438181+0.70054792j \end{bmatrix}$

———— Run time is 7914.242150068283 seconds ————
———— RESULTS ————

VIOLATION: 2.7609819906845723

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.31397484-0.02246986j \\ -0.89835813-0.30637814j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.36302214+0.79311473j \\ 0.37424865-0.3148363j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.24908027+0.07211659j \\ 0.78214353+0.56657719j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =

```
[[ -0.35311181+0.63470759j]
 [ -0.54016312+0.42506721j]]
```

```
———— Run time is 11395.665429115295 seconds ————
———— Run time is 24637.475543260574 seconds ————
```

4.19.2 Qtrits

$$h^{(79)}(\vec{r}) = 2.40448 > 2 \quad (46)$$

———— RESULTS ————

VIOLATION: 2.4044821288577527

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.47545426+0.16167801j]
[0.72209356+0.47579866j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.65896652-0.41936296j]
[0.45099315-0.39020131j]
[-0.05245087+0.1774679j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.23007068+0.06683231j]
[0.50578003-0.80875664j]
[0.17948998+0.02198945j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =

```
[[ 0.14387838+0.83004099j]
 [-0.05484209-0.42732605j]
 [ 0.13842267-0.29249773j]]
```

———— Run time is 4359.17303776741 seconds ————

4.19.3 Qquarts

$$h^{(79)}(\vec{r}) = 2.3346 > 2 \quad (47)$$

———— RESULTS ————

VIOLATION: 2.334684524055903

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]
[0.]]

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.06267306+0.27882228j]
[0.65666948+0.69793654j]
[0. +0.j]
[0. +0.j]]

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.19973672+0.67489388j]
[0.61728585+0.31247763j]
[0.15898512+0.02575142j]
[0. +0.j]]

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.0719505 +0.309551j]
[-0.64298988-0.38858047j]
[0.32440614+0.08074687j]
[-0.01655165-0.47173847j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.60281255+0.54333791j \\ -0.26048088-0.10454601j \\ -0.04704512-0.15916467j \\ -0.33673715-0.34882981j \end{bmatrix}$

———— Run time is 8606.060131549835 seconds ————

4.20 Equation 80

4.20.1 Qbits

$$\begin{aligned}
h^{(80)}(\vec{r}) &= 2.604 > 2 \\
h^{(80)}(\vec{r}) &= 2.611 > 2 \\
h^{(80)}(\vec{r}) &= 2.623 > 2 \\
h^{(80)}(\vec{r}) &= 2.683 > 2 \\
h^{(80)}(\vec{r}) &= 2.7609 > 2
\end{aligned} \tag{48}$$

———— RESULTS ————

VIOLATION: 2.6046713033196127

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11280507+0.42993764j \\ -0.68464193+0.57766259j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.83520623+0.01650447j \\ -0.34658048-0.42666161j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.30160096 - 0.59349892j \\ 0.29230615 - 0.68655154j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.33067034 - 0.29649052j \\ -0.89160176 + 0.08829949j \end{bmatrix}$

———— Run time is 110.37641525268555 seconds ————

———— RESULTS ————

VIOLATION: 2.6110096162594467

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.02263053 - 0.09717621j \\ -0.91397421 + 0.39331384j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.55509668 - 0.66485142j \\ 0.2052233 - 0.45576712j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.19199649 + 0.79686981j \\ 0.3828898 - 0.42606484j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

```
Qobj data =  
[[0.19194773-0.20865938j]  
 [0.71767902+0.63604572j]]
```

Run time is 263.7214822769165 seconds

RESULTS

VIOLATION: 2.6237213621141873

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.21679853+0.36440809j]  
 [ 0.20337619+0.88252097j]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.74455744+0.12572307j]  
 [-0.30853466+0.57847584j]]
```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.80344655+0.39561561j]  
 [0.25290537-0.36606121j]]
```

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.16280427-0.13856321j]  
 [0.1531151 +0.96480608j]]
```

Run time is 389.4795882701874 seconds

RESULTS

VIOLATION: 2.6834744251986584

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.407424 & -0.03260966j \\ -0.83805681 & -0.36139048j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.7336122 & -0.12000461j \\ 0.4628714 & +0.48286862j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.78623829 & -0.35978722j \\ 0.2096691 & +0.45653189j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.05905998 & +0.13014013j \\ -0.30837175 & +0.94046921j \end{bmatrix}$

———— Run time is 708.9147272109985 seconds ————

———— RESULTS ————

VIOLATION: 2.760923247214521

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07789195+0.29128613j \\ -0.86132056+0.40891579j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.06616869-0.86111355j \\ -0.48893061+0.12268665j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.02152949-0.82043488j \\ 0.56517127-0.08369301j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25831962+0.08340092j \\ 0.31049458-0.91099307j \end{bmatrix}$

———— Run time is 1598.5112659931183 seconds ————

4.20.2 Qtrits

$$\begin{aligned} h^{(80)}(\vec{r}) &= 2.068 > 2 \\ h^{(80)}(\vec{r}) &= 2.131 > 2 \\ h^{(80)}(\vec{r}) &= 2.4327 > 2 \end{aligned} \tag{49}$$

———— RESULTS ————

VIOLATION: 2.0687789298667068

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.11126966+0.13222666j]
 [0.59073591+0.78814101j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.08526609+0.93236384j]
 [0.07197166+0.06631333j]
 [0.02538721+0.33646021j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.35857439+0.16028051j]
 [ 0.20868579+0.74495408j]
 [-0.49494321-0.04753357j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.3950203 -0.11164417j]
 [0.70895851+0.06958607j]
 [0.20040856-0.5327913j ]]
```

———— Run time is 5.953742265701294 seconds ————

———— RESULTS ————

VIOLATION: 2.131003481956765

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.25740414+0.15642562j]
 [0.71058773+0.63587673j]]
```

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.77683844-0.18876395j]
 [-0.18237606+0.03894206j]
 [ 0.55346486-0.14067462j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.52021228-0.46449461j]
 [ 0.32818324-0.54230104j]
 [-0.3337036  -0.02170705j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.2036808  +0.42858647j]
 [ 0.63302638-0.04636813j]
 [-0.47493481+0.38261246j]]
```

———— Run time is 57.25414729118347 seconds ————

———— RESULTS ————

VIOLATION: 2.4327267205237466

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.36063646+0.03414569j]
 [0.43820625+0.82264858j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.21987825-8.57640382e-01j \\ -0.37491024+6.59884712e-04j \\ 0.26406512+7.62759338e-02j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.34433905+0.56742234j \\ -0.46936251-0.48111996j \\ -0.10181588+0.31195907j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.43804338-0.03444072j \\ 0.38621096-0.72937464j \\ -0.10616148+0.3384011j \end{bmatrix}$

———— Run time is 69.90757203102112 seconds ————

4.20.3 Qquarts

$$h^{(80)}(\vec{r}) = 2.115 > 2 \quad (50)$$

———— RESULTS ————

VIOLATION: 2.1151103506056743

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.05351348-0.10523152j \\ -0.1520063-0.04976266j \\ 0.56462791+0.68739029j \\ 0.02436626-0.4105808j \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.22333579-0.00710398j \\ 0.35461651-0.58040407j \\ -0.03165161+0.15477562j \\ 0.2079454+0.6474954j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.45383065+0.31110487j \\ -0.22858981+0.13085756j \\ -0.50745778+0.51617761j \\ 0.12844657-0.29567425j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.07118868+0.04440893j \\ 0.05675528-0.14914356j \\ -0.26170859+0.51079593j \\ 0.43447905+0.67031272j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.354867 +0.44214415j \\ -0.2735232 -0.61342539j \\ -0.3793588 -0.19789832j \\ 0.16970699-0.12487994j \end{bmatrix}$

———— Run time is 698.8040726184845 seconds ————

4.21 Equation 81

4.21.1 Qbits

$$h^{(81)}(\vec{r}) = 2.72902 > 2 \quad (51)$$

———— RESULTS ————

VIOLATION: 2.729020405762271

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =

```
[[0.19720136+0.16304088j]
 [0.95658193+0.1395719j  ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.42400427+0.70780763j]
 [0.41977761+0.3781739j  ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.54805062+0.61243891j]
 [ 0.23224914-0.52021095j  ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.00466619+0.21246386j]
 [ 0.2008605 -0.95629096j  ]]
```

———— Run time is 4763.136263370514 seconds ————

4.21.2 Qtrits

$$h^{(81)}(\vec{r}) = 2.4843 > 2 \quad (52)$$

———— RESULTS ————

VIOLATION: 2.4843538396050677

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.12782571+0.0781752j ]
 [0.03268112+0.98817062j]
 [0.          +0.j       ]]
```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.68125115 - 0.19393713j \\ -0.17742549 + 0.67654891j \\ 0.06440315 + 0.07027988j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.77884064 - 0.13079982j \\ 0.23147143 - 0.44550666j \\ -0.32702234 + 0.13152891j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.12750652 - 0.31852764j \\ -0.62114007 - 0.6678888j \\ -0.05926281 + 0.21651726j \end{bmatrix}$

Run time is 4012.7504432201385 seconds

4.21.3 Qquarts

$$h^{(81)}(\vec{r}) = 2.29789 > 2 \quad (53)$$

RESULTS

VIOLATION: 2.2978913751603276

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.36606901 + 0.18290998j \\ 0.32253734 + 0.85352627j \\ 0. + 0.j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.66821196+0.13347102j]
 [0.64251431+0.34181531j]
 [0.07755244+0.00124402j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.74098875+0.08562741j]
 [  0.37334524-0.04594321j]
 [  0.415034   -0.01581369j]
 [-0.28042686-0.22575131j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.38955356-0.24562297j]
 [  0.35164079+0.43403579j]
 [  0.45039875+0.26135512j]
 [-0.2901397  -0.34717789j]]
```

———— Run time is 11936.309901714325 seconds ————

4.22 Equation 82

4.22.1 Qbits

$$h^{(82)}(\vec{r}) = 2.70870 > 2 \quad (54)$$

———— RESULTS ————

VIOLATION: 2.708704425708758

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.64068915+0.51431879j \\ -0.24319855+0.51560455j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.30851849+0.00219818j \\ -0.56212304-0.76735207j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.18692973-0.07877639j \\ -0.08026157-0.97591477j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.54375728-0.60316496j \\ -0.57889071-0.07352273j \end{bmatrix}$

———— Run time is 3673.5624520778656 seconds ————

4.22.2 Qtrits

$$h^{(82)}(\vec{r}) = 2.4792 > 2 \quad (55)$$

RESULTS

VIOLATION: 2.4792850650076326

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[0.46684076+0.55098644j]
 [0.65510972+0.22204708j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.23130598+0.18683866j]
 [-0.66952048+0.54791479j]
 [ 0.39987248-0.05676765j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.03408645-0.29545664j]
 [-0.66702249-0.67559907j]
 [-0.03332584+0.09528781j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.40281844-0.67074379j]
 [ 0.59790653-0.07972303j]
 [-0.06965271-0.13834955j]]
```

———— Run time is 2472.6583812236786 seconds ————

4.22.3 Qquarts

$$h^{(82)}(\vec{r}) = 2.191173 > 2 \quad (56)$$

———— RESULTS ————

VIOLATION: 2.1911739166476107

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```

Qobj data =
[[0.35249652+0.86718199j]
 [0.22542034+0.27005051j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.11500637+0.11657453j]
 [0.5864262  +0.13809546j]
 [0.53688575+0.56742537j]
 [0.          +0.j       ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.20659951-0.41321144j]
 [0.15087772-0.67873197j]
 [0.25292205-0.35182956j]
 [0.13456052+0.31188402j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.18529569-0.00683924j]
 [ 0.39602673+0.2536284j ]
 [ 0.50595276+0.64632366j]
 [ 0.26337371-0.03695961j]]

```

———— Run time is 2061.6571276187897 seconds ————

4.23 Equation 83

4.23.1 Qbits

$$h^{(83)}(\vec{r}) = 2.7633452 > 2 \quad (57)$$

———— RESULTS ————

VIOLATION: 2.7633452367811184

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```

```
[[1.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.5653155 +0.61267501j]  
 [0.43273435+0.3432036j ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.21736891+0.36375394j]  
 [0.53844922+0.72835861j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.23272502+0.09684711j]  
 [ 0.78344103-0.56804917j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.48671758-0.6173641j ]  
 [ 0.49230974+0.37362908j ]]
```

———— Run time is 1103.3330392837524 seconds ————

4.23.2 Qtrits

$$h^{(83)}(\vec{r}) = 2.5640 > 2 \quad (58)$$

———— RESULTS ————

VIOLATION: 2.564082651261494

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.75045737+0.22870944j]
 [0.33683356+0.52062354j]
 [0.          +0.j      ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.11610655+0.16399204j]
 [-0.79759143+0.50911206j]
 [ 0.12034819-0.22314797j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.19024558-0.34078112j]
 [-0.1586211  +0.71338057j]
 [-0.27429761-0.48822452j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.15495774-0.72760663j]
 [-0.32426169+0.50366346j]
 [-0.16847548-0.24365995j]]

```

———— Run time is 107.510897397995 seconds ————

4.23.3 Qquarts

$$h^{(83)}(\vec{r}) = 2.3568 > 2 \quad (59)$$

———— RESULTS ————

VIOLATION: 2.356815018435408

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.46720258+0.6941101j] \\ [0.35957967+0.41308034j] \\ [0. +0.j] \\ [0. +0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.29803962+0.39888455j] \\ [0.59510127+0.55096269j] \\ [0.09471262+0.2922116j] \\ [0. +0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.17455405-0.20444277j] \\ [-0.81900329-0.07793231j] \\ [-0.2208628 -0.28186546j] \\ [-0.2030047 -0.28540284j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.50281381-0.38888621j] \\ [0.36605364+0.173018j] \\ [-0.0260613 +0.45749962j] \\ [0.02832386+0.47034876j] \end{bmatrix}$

Run time is 2816.0841042995453 seconds

4.24 Equation 84

4.24.1 Qbits

$$h^{(84)}(\vec{r}) = 2.74902 > 2 \quad (60)$$

RESULTS

VIOLATION: 2.7490201028910866

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.7589127 - 0.38070628j \\ 0.10739224 - 0.51728247j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.08070531 + 0.19889488j \\ -0.66223181 - 0.71789728j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.649366 + 0.51458212j \\ 0.06371807 - 0.55629943j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24345846 + 0.19326171j \\ -0.25613039 + 0.91530056j \end{bmatrix}$

———— Run time is 809.4807584285736 seconds ————
———— Run time is 12024.971846818924 seconds ————

4.24.2 Qtrits

$$h^{(84)}(\vec{r}) = 2.3504 > 2 \quad (61)$$

———— RESULTS ————

VIOLATION: 2.3504651913104184

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.51443269+0.59745434j]
 [0.22837833+0.57118356j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[-0.34887563+0.08064425j]
 [0.71494635+0.57142614j]
 [-0.16487408+0.08320288j]]

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[-0.08200523-0.8049333j]
 [-0.31090158+0.46615413j]
 [-0.16399827-0.06710164j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[-0.20657065+0.22067076j]
 [-0.75465874-0.47384905j]
 [-0.26932461-0.20507195j]]

———— Run time is 396.7241153717041 seconds ————

4.24.3 Qquarts

$$h^{(84)}(\vec{r}) = 2.118 > 2 \quad (62)$$

———— RESULTS ————

VIOLATION: 2.1188617384557804

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```
Qobj data =  
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[0.80920975+0.52839296j]  
 [0.15321241+0.20617084j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[0.14397      +0.10602359j]  
 [0.81639589+0.09555362j]  
 [0.08262666+0.53438911j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[-0.17032542-0.06979161j]  
 [ 0.40119024+0.21736709j]  
 [-0.06981904+0.854578j  ]  
 [ 0.09269345-0.11893692j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =  
[[ 0.29068173-0.33589709j]  
 [ 0.25824215-0.78754542j]  
 [ 0.08648229+0.26930548j]  
 [-0.06312669-0.17824389j]]
```

———— Run time is 675.6810936927795 seconds ————

4.25 Equation 85

4.25.1 Qbits

$$h^{(85)}(\vec{r}) = 2.7312 > 2 \quad (63)$$

RESULTS

VIOLATION: 2.731205793925692

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.56702321+0.4807853j \\ -0.59610445-0.30329796j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.07059448+0.22670458j \\ -0.5979575 +0.76555097j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.80036807-0.38499701j \\ -0.34957153-0.29830856j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.41363332-0.08834702j \\ -0.21719759-0.87973149j \end{bmatrix}$

Run time is 1283.0971915721893 seconds

4.25.2 Qtrits

$$h^{(85)}(\vec{r}) = 2.607524 > 2 \quad (64)$$

RESULTS

VIOLATION: 2.6075245478937363

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.68264362+0.40108931j]
 [0.60298368+0.09765109j]
 [0.          +0.j      ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.31532547-0.13307023j]
 [-0.77171605+0.30048474j]
 [ 0.17103053+0.40960223j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.74199363-0.10301971j]
 [-0.40009741+0.18773113j]
 [ 0.31261796+0.38181342j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.02601343+0.25944819j]
 [ 0.02267218-0.74350914j]
 [-0.58852604+0.1797976j ]]

```

———— Run time is 1770.5622103214264 seconds ————

4.25.3 Qquarts

$$h^{(85)}(\vec{r}) = 2.43565 > 2 \quad (65)$$

———— RESULTS ————

VIOLATION: 2.435654938189966

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.53110419+0.61903168j]  
 [0.4419721 +0.37334807j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.09378966+0.37055761j]  
 [0.66911981+0.59654003j]  
 [0.06110951+0.21581212j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.33187684 -0.36495401j]  
 [ 0.3856049  +0.30435759j]  
 [-0.04602265 +0.63747851j]  
 [ 0.16381365 +0.28286004j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.20591184 -0.02133531j]  
 [ 0.69500726 +0.33586588j]  
 [-0.04084987 +0.56038504j]  
 [ 0.2084278  +0.04649608j]]
```

———— Run time is 7134.988867521286 seconds ————

4.26 Equation 86

4.26.1 Qbits

$$h^{(86)}(\vec{r}) = 2.76341 > 2 \quad (66)$$

RESULTS

VIOLATION: 2.7634101130522124

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.06291078+0.84895278j \\ -0.42979531+0.30099401j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.27131478+0.67072561j \\ 0.43576984-0.53536912j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.25978738-0.0330052j \\ 0.23387333+0.93633564j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.17346833-0.30637322j \\ 0.92999401+0.1056188j \end{bmatrix}$

Run time is 35921.40564870834 seconds

4.26.2 Qtrits

$$h^{(86)}(\vec{r}) = 2.68194 > 2 \quad (67)$$

RESULTS

VIOLATION: 2.681949213959466

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.46328499+0.57309967j]
 [0.55765547+0.3820264j ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.43815758-0.66470362j]
 [  0.49825496+0.26373712j]
 [  0.05276228-0.21351324j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.01240921+0.40076862j]
 [ -0.56817017-0.6544852j ]
 [ -0.05249655+0.29207263j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.26175695-0.11430599j]
 [ 0.68153452-0.66776148j]
 [-0.08839393-0.01446563j]]
```

Run time is 1035.146297454834 seconds

Run time is 10567.996613025665 seconds

4.26.3 Qquarts

$$h^{(86)}(\vec{r}) = 2.0899 > 2 \quad (68)$$

RESULTS

VIOLATION: 2.089955831976824

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.63004 +0.75392733j]
 [0.04346601+0.18098034j]
 [0. +0.j]
 [0. +0.j]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.15858117+0.1109213j]
 [0.23217212+0.04837273j]
 [0.74707981+0.59006476j]
 [0. +0.j]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.03856378+0.0112914j]
 [ 0.04875915+0.02845973j]
 [-0.48235704+0.81930662j]
 [-0.1948462 -0.2308706j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.09359434+0.54583304j]
 [-0.08346228+0.20363967j]
 [ 0.0369647 -0.4218336j]
 [ 0.38932845+0.56034338j]]
```

Run time is 2772.157503604889 seconds

4.27 Equation 87

4.27.1 Qbits

$$h^{(87)}(\vec{r}) = 2.777579 > 2 \quad (69)$$

RESULTS

VIOLATION: 2.777579620651287

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.71616283 - 0.39867859j \\ 0.47221435 - 0.32431433j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.75858863 - 0.26925772j \\ -0.49423952 + 0.32828474j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.18634473 - 0.23244985j \\ 0.61172532 - 0.73282661j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.29605153 - 0.09486324j \\ 0.93606211 + 0.16474887j \end{bmatrix}$

Run time is 225223.06397914886 seconds

Run time is 253839.53466701508 seconds

4.28 Equation 88

4.28.1 Qtrits

$$\begin{aligned}h^{(88)}(\vec{r}) &= 3.085 > 3 \\h^{(88)}(\vec{r}) &= 3.1306 > 3 \\h^{(88)}(\vec{r}) &= 3.1364 > 3 \\h^{(88)}(\vec{r}) &= 3.24429 > 3\end{aligned}\tag{70}$$

RESULTS

VIOLATION: 3.0852763226996966

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.68517562+0.11691281j \\ 0.7151658 +0.0735095j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.06842714-0.50102522j \\ -0.00302575-0.07205336j \\ -0.76135612-0.3992837j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.20730392+0.88843102j \\ 0.0523762 +0.01594907j \\ 0.21655646-0.34325074j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[ -0.93682868 -0.07116479j]
 [ -0.23222156 +0.14006509j]
 [  0.16842475 +0.12399848j]]
```

Run time is 9.175842761993408 seconds

RESULTS

VIOLATION: 3.1306929895376845

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[0.47695355+0.50572261j]
 [0.64887259+0.30939346j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[0.00210741-0.27314586j]
 [0.08803608-0.52689766j]
 [0.39738485+0.69433471j]]
```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.59554731+0.05374427j]
 [ -0.0747527  -0.66757963j]
 [  0.1350481  -0.41586828j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ 0.72433925+0.12031217j]
 [ 0.36611221+0.48668095j]
 [-0.18276741+0.23781762j]]
```

———— Run time is 12.390474319458008 seconds ————

RESULTS

VIOLATION: 3.1364101654180514

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.36386706+0.47284819j \\ 0.56365724+0.57123188j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.51536293-0.1303681j \\ 0.3539127 +0.11787946j \\ -0.29757902+0.69978723j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.16673794-0.35917383j \\ -0.1008467 -0.12985663j \\ 0.77250418+0.46839845j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.04661834+0.73246334j \\ 0.1488844 +0.43370302j \\ -0.49962946+0.03781147j \end{bmatrix}$

———— Run time is 67.9677312374115 seconds ————

RESULTS

VIOLATION: 3.244298151354299

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.07522359+0.65599366j]
[0.38080351+0.64730396j]
[0. +0.j]]

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.02552527+0.42899774j]
[0.02308905+0.49954561j]
[-0.63295497-0.40570738j]]

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.61099639-0.07620561j]
[0.0510633 +0.21617134j]
[0.51454643+0.55387777j]]

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.30586877+0.71521314j]
[0.30002196+0.32155184j]
[-0.37800078+0.24211797j]]

———— Run time is 104.66231083869934 seconds ————

4.28.2 Qquarts

$$h^{(88)}(\vec{r}) = 3.092 > 3$$

$$h^{(88)}(\vec{r}) = 3.1355 > 3$$

$$h^{(88)}(\vec{r}) = 3.169 > 3$$

$$\begin{aligned}
h^{(88)}(\vec{r}) &= 3.2007 > 3 \\
h^{(88)}(\vec{r}) &= 3.258 > 3
\end{aligned}
\tag{71}$$

RESULTS

VIOLATION: 3.0927205419002615

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.40980978+0.34233863j \\ 0.77345442+0.34150911j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.12724779+0.08288181j \\ 0.36784878+0.86321659j \\ 0.21760662+0.22165372j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.35165988-0.07367111j \\ 0.10410306-0.05999016j \\ 0.75327074-0.22978182j \\ -0.40932081+0.26212901j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.53407655+0.29141681j \\ 0.69674675+0.29782156j \\ 0.15827535+0.10700012j \end{bmatrix}$

$[-0.10101825+0.09476265j]$

Run time is 253.83705115318298 seconds

RESULTS

VIOLATION: 3.1355176954352824

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.57036454+0.44528457j \\ 0.66946794+0.167984j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.58210319+0.26369877j \\ 0.36641291+0.05899483j \\ 0.18296221+0.64838635j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.17650261-0.31674375j \\ -0.47445117+0.53722985j \\ -0.37096561+0.02568292j \\ 0.28695937-0.36630538j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.72599598-0.42875049j \\ 0.27480291-0.37478753j \end{bmatrix}$

```
[0.24742867-0.08781085j]
[0.03080596+0.05691939j]]
```

Run time is 256.25669717788696 seconds

RESULTS

VIOLATION: 3.1695144683468954

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.53013291+0.30759539j]
[0.53000241+0.58603892j]
[0. +0.j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.54908433+0.12664245j]
[0.23307207+0.33509831j]
[0.15836547+0.70055335j]
[0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.3734981 -0.11751822j]
[0.21929824+0.09133924j]
[0.38035228+0.29265435j]
[0.01412674+0.74815778j]]

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.83164666-0.13951377j]]

```
[ -0.3148639  -0.20683444j ]
[ -0.19501618 -0.31378427j ]
[  0.09960622+0.02380545j ]]
```

———— Run time is 330.39977502822876 seconds ————

———— RESULTS ————

VIOLATION: 3.200757022475149

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.19354562+0.60502254j]
 [0.56807191+0.52324193j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.07806358+0.15941039j]
 [0.40408404+0.47815023j]
 [0.27557817+0.70755885j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.02342942 -0.25571102j ]
 [ -0.58420557 -0.26217391j ]
 [  0.44216444 -0.37406183j ]
 [  0.33218021 -0.27974327j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```

[[-0.19882892-0.53318079j]
 [-0.52612582-0.40734171j]
 [ 0.13601837-0.37668435j]
 [ 0.2013561 -0.18031441j]]

```

Run time is 334.7342174053192 seconds

RESULTS

VIOLATION: 3.258162666347021

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.4800308 +0.08190064j]
 [0.79162059+0.36905225j]
 [0.          +0.j        ]
 [0.          +0.j        ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.29315102+0.54862298j]
 [0.1630694 +0.18316282j]
 [0.73855681+0.08642276j]
 [0.          +0.j        ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[ 0.03570418-0.32994326j]
 [ 0.49241428-0.25128462j]
 [-0.20943191-0.29831405j]
 [ 0.66260534+0.11112169j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ -0.63829464 -0.15424143j ]
 [ -0.47862637 -0.40303677j ]
 [ -0.26316593 +0.12505634j ]
 [  0.00253222 -0.30391759j ]]

```

———— Run time is 2324.5431451797485 seconds ————

4.29 Equation 89

4.29.1 Qtrits

$$h^{(89)}(\vec{r}) = 3.2998 > 3 \quad (72)$$

———— RESULTS ————

VIOLATION: 3.2998110520373727

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```

[[ 1.]
 [ 0.]
 [ 0.]]

```

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```

[[ 0.60785879 +0.54121529j ]
 [ 0.57997812 +0.03491544j ]
 [ 0.          +0.j          ]]

```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```

[[ 0.50342244 -0.0045667j ]
 [ -0.35121078 -0.35909027j ]
 [ 0.69733203 -0.08932072j ]]

```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```

[[ 0.80032112 -0.3152735j ]
 [ 0.06719969 -0.45454522j ]
 [ 0.08355127 -0.20489206j ]]

```

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.44369852-0.04080017j \\ 0.29068643-0.57248616j \\ -0.01115265-0.62378168j \end{bmatrix}$

———— Run time is 12350.533843517303 seconds ————

4.29.2 Qquarts

$$h^{(89)}(\vec{r}) = 3.1895 > 3 \quad (73)$$

VIOLATION: 3.189587346970258

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.57000534+0.50469285j \\ 0.36359841+0.53681955j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.4959138 +0.35869552j \\ 0.16074542+0.26544643j \\ 0.52600897+0.50241487j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.80500372+0.12070262j \end{bmatrix}$

```
[0.28985118+0.30318261j]
[0.38873071-0.08853355j]
[0.04080744+0.02918003j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.24238933-0.22098185j]
 [ 0.56860417+0.17538551j]
 [-0.095614   -0.70213024j]
 [ 0.04347251+0.18526976j]]
```

———— Run time is 4840.455719232559 seconds ————

4.30 Equation 90

4.30.1 Qtrits

$$h^{(90)}(\vec{r}) = 3.32429 > 3 \quad (74)$$

———— RESULTS ————

VIOLATION: 3.3242913567098835

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.02916648+0.59388792j]
 [0.61858502+0.51361369j]
 [0.          +0.j         ]
 [0.          +0.j         ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.00218112+0.55628668j]
 [0.16562913+0.11202975j]
 [0.76284609+0.26195906j]
```

```
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.80377353+0.24163828j]
 [ 0.38212209-0.2308707j ]
 [ 0.17988249-0.20967462j]
 [-0.07068438+0.1221599j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.42069312+0.26163006j]
 [ -0.29596869+0.18331582j]
 [ -0.25608977+0.11703875j]
 [ -0.47131916-0.57614501j ]]
```

———— Run time is 12440.915131568909 seconds ————

4.30.2 Qquarts

$$h^{(90)}(\vec{r}) = 3.27289 > 3 \quad (75)$$

———— RESULTS ————

VIOLATION: 3.272894971677221

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.47786015+0.41960548j]
 [0.45304233+0.62476681j]
 [0.          +0.j          ]
 [0.          +0.j          ]]
```

This is vector C:


```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.65790139+0.50465884j]
 [0.49390233+0.24312547j]
 [0.05797893+0.07793692j]
 [0.          +0.j          ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.43999199-0.2451214j ]
 [-0.54836968+0.22743853j]
 [-0.29924708-0.15670606j]
 [-0.3904636  +0.35681584j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.26279457+0.39083714j]
 [-0.37048616+0.50101329j]
 [ 0.0586975  +0.29024783j]
 [-0.13874443-0.53195095j]]

```

———— Run time is 1802.9048507213593 seconds ————

4.31 Equation 91

4.31.1 Qtrits

$$h^{(90)}(\vec{r}) = 3.30354 > 3 \quad (76)$$

———— RESULTS ————

VIOLATION: 3.3035420185213207

This is vector A:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

This is vector B:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.85191017+0.36512605j]

```

```
[0.11227288+0.35822735j]
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[9.44798766e-01-0.16918192j]
 [1.06751218e-01+0.11506331j]
 [2.81204790e-04-0.23258827j]]
```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.13643258+0.37166266j]
 [ -0.54831251+0.60825611j]
 [ 0.26643204-0.31881793j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ 0.03484464+0.57164929j]
 [-0.48171985+0.17673577j]
 [-0.63745741+0.04859464j]]
```

———— Run time is 11264.906569719315 seconds ————

4.31.2 Qquarts

$$h^{(90)}(\vec{r}) = 3.34471 > 3 \quad (77)$$

RESULTS

VIOLATION: 3.344719524305435

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[0.45858945+0.53418874j]
 [0.64925616+0.28775778j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[0.08929669+0.44544352j]
 [0.57398008+0.52255975j]
 [0.40457624+0.16553673j]
 [0.          +0.j       ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 0.27125548+0.36486377j]
 [ 0.40179378+0.58511027j]
 [-0.24843917-0.34035679j]
 [ 0.09036433-0.32213685j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.32139836-0.16448283j]
 [-0.59449177+0.02268004j]
 [ 0.30148464-0.34607798j]
 [-0.50223572-0.22980418j]]

```

———— Run time is 2169.0113739967346 seconds ————

4.32 Equation 92

4.32.1 Qtrits

$$h^{(92)} = 3.1329 > 3$$

$$h^{(92)} = 3.252 > 3$$

$$h^{(92)} = 3.265 > 3$$

(78)

———— RESULTS ————

VIOLATION: 3.1329202284273245

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.30559143+0.74297288j]
 [0.47035058+0.36520611j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.62224098+0.60761951j]
 [ 0.07812266+0.23888748j]
 [-0.26318595-0.33343285j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.66670232-0.30164276j]
 [ 0.53428676-0.21450545j]
 [ 0.36473859+0.00323924j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.01692972+0.74333082j]
 [-0.12915118-0.01249509j]
 [ 0.65017134-0.08725685j]]
```

———— Run time is 7.168102502822876 seconds ————

———— RESULTS ————

VIOLATION: 3.2528455725730003

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
```

[0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.3107719 +0.93920215j]
 [0.12284947+0.07891863j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.59346319+0.35849366j]
 [-0.48711362-0.51795871j]
 [0.03525598+0.11171329j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.65598069-0.48131118j]
 [-0.33894965-0.35110073j]
 [-0.21504194-0.23157562j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.44339624+0.48272738j]
 [0.13502715+0.06860122j]
 [-0.67657665-0.29946558j]]

———— Run time is 18.547130346298218 seconds ————

———— RESULTS ————

VIOLATION: 3.2658161223531157

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.67203393+0.35934426j \\ 0.34146751+0.55012911j \\ 0. +0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.27125487-0.72823865j \\ 0.30357147+0.30596555j \\ -0.1177586 -0.44322864j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.43220255-0.82030182j \\ 0.06631941-0.02472238j \\ 0.27085048+0.24887031j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.11722246+0.80837849j \\ 0.48962032-0.13855549j \\ 0.26500856-0.06023205j \end{bmatrix}$

———— Run time is 239.7511646747589 seconds ————

4.32.2 Qquarts

$$h^{(92)}(\vec{r}) = 3.078 > 3$$

$$h^{(92)}(\vec{r}) = 3.169 > 3$$

$$h^{(92)}(\vec{r}) = 3.1799 > 3 \tag{79}$$

———— RESULTS ————

VIOLATION: 3.0780094754792167

This is vector A:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

```
[0.]  
[0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket  
Qobj data =  
[[0.98813633+0.01888685j]  
 [0.07159247+0.13455259j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket  
Qobj data =  
[[0.48602189+0.53465241j]  
 [0.39720547+0.12773941j]  
 [0.26356121+0.4841234j ]  
 [0.          +0.j          ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket  
Qobj data =  
[[-0.35407014-0.71200628j]  
 [-0.19073578-0.27166066j]  
 [ 0.28831133+0.26982216j]  
 [-0.19540626+0.25177513j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket  
Qobj data =  
[[-0.47130737-0.42663214j]  
 [ 0.42300637+0.42330987j]  
 [ 0.01242829-0.26711891j]  
 [-0.29988989-0.27620252j]]
```

———— Run time is 2.3315680027008057 seconds ————

———— RESULTS ————

VIOLATION: 3.1692140914728197

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket  
Qobj data =  
[[1.]
```

```
[0.]
[0.]
[0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.84947218+0.16612387j]
 [0.38525643+0.31996461j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.49873511+0.61045927j]
 [0.22790226+0.01116736j]
 [0.56846988+0.05814307j]
 [0.          +0.j       ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.00202865+0.61907454j]
 [-0.00436903-0.22726882j]
 [-0.54158071+0.08688861j]
 [-0.13399535+0.49624423j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.18514273+0.74706152j]
 [ 0.22677827-0.45594003j]
 [ 0.08905901+0.03250611j]
 [ 0.01967688-0.37274149j]]
```

———— Run time is 244.6129207611084 seconds ————

———— RESULTS ————

VIOLATION: 3.179987556077784

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
```



```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.5375258 +0.83693677j]
 [0.05776762+0.08523944j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.33126896+0.60805994j]
 [0.63899823+0.2455156j ]
 [0.13393943+0.18435717j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.56587515-0.30204742j]
 [ 0.32308477+0.08418679j]
 [ 0.01536263-0.31837258j]
 [ 0.32271254+0.52090402j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.74157949+0.20741409j]
 [-0.35648786-0.10775877j]
 [-0.2932365  +0.01817207j]
 [ 0.33883616+0.25926028j]]
```

———— Run time is 383.0301568508148 seconds ————

4.33 Equation 93

4.33.1 Qbits

$$h^{(93)}(\vec{r}) = 3.523 > 3$$

$$h^{(93)}(\vec{r}) = 3.556 > 3 \tag{80}$$

RESULTS

VIOLATION: 3.5236227757103427

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.16030287+0.12509534j \\ -0.02165356+0.97886938j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.57977376-0.07366475j \\ -0.48731609+0.64881347j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.26532567+0.88488557j \\ 0.32231606+0.20662084j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.18012392-0.68912251j \\ -0.46340226-0.52718486j \end{bmatrix}$

Run time is 276.613760471344 seconds

RESULTS

VIOLATION: 3.5562641435781046

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \end{bmatrix}$

[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.05714598-0.2812353j]
 [-0.94336618+0.16643705j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.10586159+0.44145971j]
 [0.89070455-0.02349565j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.9109591 -0.3149155j]
 [-0.12410203+0.23575502j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.63049334+0.44892688j]
 [0.24606737-0.58343265j]]

———— Run time is 290.2329652309418 seconds ————

4.33.2 Qtrits

$$h^{(93)}(\vec{r}) = 3.3279 > 3$$

$$h^{(93)}(\vec{r}) = 3.3416 > 3$$

$$h^{(93)}(\vec{r}) = 3.3841 > 3$$

(81)

RESULTS

VIOLATION: 3.3279016495378504

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.43732199+0.30655427j \\ 0.75304599+0.38431196j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.48852026+0.09203421j \\ 0.02373859-0.54548247j \\ 0.58555353+0.33449975j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.47077377+0.5959067j \\ -0.15623146-0.25396491j \\ 0.56964569-0.09932074j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.76944709+0.26594895j \\ -0.37942808-0.25524662j \\ 0.29444276+0.20349271j \end{bmatrix}$

———— Run time is 11.609578609466553 seconds ————

———— RESULTS ————

VIOLATION: 3.3416758952647934

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```
Qobj data =  
[[0.32006012+0.13667414j]  
 [0.39890014+0.84838693j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```
Qobj data =  
[[-0.0357492 +0.40362913j]  
 [-0.12954224+0.50083642j]  
 [-0.65397613-0.37483653j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```
Qobj data =  
[[ 0.07633136+0.37319939j]  
 [-0.13876779+0.30198824j]  
 [-0.8599767  -0.0698743j ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```
Qobj data =  
[[-0.56650364+0.09663102j]  
 [-0.49612218-0.17362231j]  
 [ 0.08847741-0.62098784j]]
```

———— Run time is 60.965237617492676 seconds ————

———— RESULTS ————

VIOLATION: 3.384121142255621

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```
Qobj data =  
[[0.0401917+0.22120946j]  
 [0.5036834+0.83411872j]  
 [0.          +0.j          ]]
```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33505208+0.03543526j \\ -0.24300518-0.60597024j \\ -0.46657662-0.49248275j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.40764533+0.38641823j \\ -0.24600072-0.41015761j \\ -0.57030176-0.36127071j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.40031126-0.27093369j \\ -0.16194734-0.76471519j \\ -0.3541167-0.17300558j \end{bmatrix}$

Run time is 389.8819863796234 seconds

4.33.3 Qquarts

$$h^{(93)}(\vec{r}) = 3.06009 > 3$$

$$h^{(93)}(\vec{r}) = 3.1046 > 3$$

$$h^{(93)}(\vec{r}) = 3.1365 > 3 \tag{82}$$

RESULTS

VIOLATION: 3.060095484080233

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.03346123+0.2829013j ]
 [0.13969023+0.94833214j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.11572183+0.15220449j]
 [0.3403051  +0.76774706j]
 [0.45885302+0.21829578j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.12898621+0.05777253j]
 [0.11593543+0.4507258j ]
 [0.7514901  +0.33541006j]
 [0.2314749  -0.18058853j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.10621765+0.14983185j]
 [  0.27865075+0.86483553j]
 [  0.15245772+0.29217701j]
 [  0.11596888-0.13646225j]]
```

———— Run time is 87.1478762626648 seconds ————

———— RESULTS ————

VIOLATION: 3.1046889354024545

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.31579154+0.05431043j]
 [0.64844704+0.69053785j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.23835118+0.28216847j]
 [0.33623912+0.03196435j]
 [0.83098519+0.24280613j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.46663627+0.18846317j]
 [ -0.01286519+0.00202771j]
 [ -0.74841219-0.05729587j]
 [  0.24110211-0.35359403j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.71162346+0.28369855j]
 [ 0.43117955+0.05837246j]
 [ 0.40289949+0.07910675j]
 [-0.2268824  +0.06101257j]]
```

———— Run time is 312.8461346626282 seconds ————

———— RESULTS ————

VIOLATION: 3.1365533244244266

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

```

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.14664879+0.37950097j]
 [0.80042835+0.44021314j]
 [0.          +0.j        ]
 [0.          +0.j        ]]

```

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.19131247+0.19118907j]
 [0.40409857+0.62140027j]
 [0.20698304+0.57842056j]
 [0.          +0.j        ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.16093818+0.5994377j ]
 [-0.39123999+0.09324316j]
 [-0.2907218  +0.54983805j]
 [-0.2178298  -0.13681911j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.05910387-0.57725225j]
 [-0.31405463-0.64427641j]
 [ 0.17096843-0.2766852j ]
 [ 0.20187021-0.05502433j]]

```

```

——— Run time is 3698.5121273994446 seconds ———

```

4.34 Equation 94

4.34.1 Qbits

$$h^{(94)}(\vec{r}) = 3.3232 > 3$$

$$h^{(94)}(\vec{r}) = 3.3537 > 3$$

$$h^{(94)}(\vec{r}) = 3.4287 > 3$$

$$h^{(94)}(\vec{r}) = 3.58101 > 3 \tag{83}$$

RESULTS

VIOLATION: 3.323246730125394

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.01354978-0.27100439j \\ 0.96225643+0.02087058j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.00927554+0.20518048j \\ 0.97863047-0.0098662j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.64744223-0.57318294j \\ 0.44062858+0.24109403j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.48501728-0.59496261j \\ 0.27987547-0.57658256j \end{bmatrix}$

Run time is 16.43269920349121 seconds

RESULTS

VIOLATION: 3.3537580072358235

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \end{bmatrix}$

[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[0.38017119-0.28558959j]
[-0.64023259+0.60333298j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.1971056 +0.43676656j]
[-0.87739035+0.02388569j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.43163155-0.81997475j]
[-0.00272427+0.37593643j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.38281101+0.8492006j]
[-0.09132919-0.35209807j]]

———— Run time is 23.90286087989807 seconds ————

———— RESULTS ————

VIOLATION: 3.4287442634372947

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[1.]
[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.21917632+0.13618842j]
[0.86250684-0.43531184j]]

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.03078322 - 0.00643287j \\ -0.07757449 - 0.99649045j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.40855202 + 0.57471331j \\ -0.29265395 - 0.64586649j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25959346 + 0.5347525j \\ -0.49506784 - 0.6336867j \end{bmatrix}$

———— Run time is 38.29786205291748 seconds ————

———— RESULTS ————

VIOLATION: 3.5810171324313393

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.42791949 + 0.12722508j \\ 0.51556699 - 0.73136131j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.06168049 - 0.11444577j \\ 0.5768699 + 0.80642346j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.01385292+0.89070888j \\ 0.44443607+0.09445827j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.63838925-0.13213132j \\ -0.10574582+0.75087835j \end{bmatrix}$

———— Run time is 208.39363527297974 seconds ————

4.34.2 Qtrits

$$\begin{aligned} h^{(94)}(\vec{r}) &= 3.084 > 3 \\ h^{(94)}(\vec{r}) &= 3.4769 > 3 \end{aligned} \tag{84}$$

———— RESULTS ————

VIOLATION: 3.084777712962037

This is vector A:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.08254285+0.30205004j \\ 0.21454491+0.92516103j \\ 0. +0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.42978236-0.26880544j \\ 0.69955883+0.04993608j \\ 0.24197223+0.43886675j \end{bmatrix}$

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.33555271+0.30260892j]
 [ 0.79047698+0.40451347j]
 [-0.06465002-0.05628142j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.6708573 +0.02899952j]
 [-0.67068222+0.29456792j]
 [-0.07825807-0.08000179j]]
```

———— Run time is 19.033893585205078 seconds ————

———— RESULTS ————

VIOLATION: 3.476903499168665

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.09256447+0.28119681j]
 [0.6994344 +0.65050111j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.12005886+0.05871715j]
 [ 0.06933942+0.52012007j]
 [ 0.81649802-0.20034049j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.33619661-0.1030071j ]
 [-0.81321959+0.44303726j]]
```

$[-0.11733448-0.07061075j]$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.4867918 + 0.41743651j \\ 0.55809483 + 0.01123073j \\ -0.25378375 - 0.46127903j \end{bmatrix}$

———— Run time is 28.6210298538208 seconds ————

4.34.3 Qquarts

$$h^{(94)}(\vec{r}) = 3.06876 > 3$$

$$h^{(94)}(\vec{r}) = 3.109222 > 3 \quad (85)$$

———— RESULTS ————

VIOLATION: 3.0687671643727086

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.10548289 + 0.17891651j \\ 0.63847162 + 0.74109125j \\ 0. + 0.j \\ 0. + 0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.58846253 + 0.11332677j \\ 0.49561303 + 0.11827065j \\ 0.54141122 + 0.29685446j \\ 0. + 0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.14695182-0.31369943j ]
 [ -0.63327198-0.46041213j ]
 [  0.27118264+0.21853232j ]
 [ -0.2428444  +0.29447463j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.11049434-0.77041984j ]
 [  0.03583838-0.59448619j ]
 [  0.17808518+0.0120631j  ]
 [  0.0551223  +0.06817437j ]]
```

———— Run time is 222.05861711502075 seconds ————

———— RESULTS ————

VIOLATION: 3.1092223748563743

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 1.]
 [ 0.]
 [ 0.]
 [ 0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.36721669+0.38633768j ]
 [ 0.52801074+0.66113521j ]
 [ 0.          +0.j         ]
 [ 0.          +0.j         ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.0837238  +0.5264013j ]
 [ 0.29737547+0.07605674j ]
 [ 0.13422999+0.77695399j ]
 [ 0.          +0.j         ]]
```

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.13694629+0.30212957j \\ 0.54118064+0.66409727j \\ 0.23518142-0.27688697j \\ 0.05432175+0.14537612j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.84028904+0.0588236j \\ 0.39796645-0.22088187j \\ 0.22809738-0.06094763j \\ -0.04000091+0.16107427j \end{bmatrix}$

———— Run time is 954.7360458374023 seconds ————

4.35 Equation 95

4.35.1 Qbits

$$h^{(95)}(\vec{r}) = 3.64416 > 3 \quad (86)$$

———— RESULTS ————

VIOLATION: 3.64416263484174

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.4403063 -0.08679581j \\ -0.40356974+0.79732573j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.04240721-0.00860179j \\ -0.46184926-0.88590231j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59835231 - 0.34442895j \\ -0.56137025 + 0.45629668j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.78824222 - 0.44960905j \\ -0.05766264 - 0.41617415j \end{bmatrix}$

———— Run time is 6078.814225196838 seconds ————

4.35.2 Qtrits

$$h^{(95)}(\vec{r}) = 3.5783 > 3 \quad (87)$$

———— RESULTS ————

VIOLATION: 3.5783752271320317

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07037751 + 0.43638746j \\ 0.63789789 + 0.63063403j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.0804638 - 0.11380727j \\ -0.37981947 + 0.63249119j \\ 0.65614105 + 0.07579231j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.03434957+0.66225902j \\ 0.68465876+0.21241483j \\ -0.00157357-0.21529731j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.26233807-0.50565052j \\ -0.60931359-0.43104446j \\ 0.06231305-0.33845382j \end{bmatrix}$

———— Run time is 12128.557060718536 seconds ————

4.35.3 Qquarts

$$h^{(95)}(\vec{r}) = 3.347213 > 3 \quad (88)$$

———— RESULTS ————

VIOLATION: 3.347213222510048

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.28979667+0.09585172j \\ 0.65381438+0.69235619j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.00230237+0.43984413j \end{bmatrix}$

```
[0.07142644+0.39484657j]
[0.64906882+0.4735356j ]
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.66292663+0.62824543j]
 [ -0.24036172+0.20386601j]
 [  0.10704513+0.18631641j]
 [  0.08268496-0.11615326j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.35056405+0.42385474j]
 [ -0.47661636+0.55606596j]
 [ -0.07284275-0.31460716j]
 [  0.11328635+0.2096711j ]]
```

———— Run time is 1247.1722662448883 seconds ————

4.36 Equation 96

4.36.1 Qbits

$$h^{(96)}(\vec{r}) = 3.6131 > 3 \quad (89)$$

———— RESULTS ————

VIOLATION: 3.613131502041597

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.00717575+0.18108876j]
 [0.85937063-0.47816052j]]
```

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.23345064 - 0.35793276j \\ -0.78682405 - 0.44530087j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.72413738 + 0.24397815j \\ -0.18821211 + 0.6169894j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.91917557 + 0.0912302j \\ -0.3525536 + 0.14999763j \end{bmatrix}$

———— Run time is 3656.698590993881 seconds ————

4.36.2 Qtrits

$$h^{(96)}(\vec{r}) = 3.620275 > 3 \quad (90)$$

———— RESULTS ————

VIOLATION: 3.6202755842696286

This is vector A:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.1232032 + 0.21565286j \\ 0.69262868 + 0.67718559j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.25832324 - 0.33313407j \end{bmatrix}$

```
[-0.57688646-0.06836447j]
[-0.38068956-0.58300478j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.4556957 +0.56917077j]
 [0.57245577+0.15564558j]
 [0.14506557+0.30888654j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.57553491+0.06832956j]
 [-0.24879333-0.02826468j]
 [-0.74006904-0.23171415j]]
```

———— Run time is 3760.628028154373 seconds ————

4.36.3 Qquarts

$$h^{(96)}(\vec{r}) = 3.2661 > 3 \quad (91)$$

———— RESULTS ————

VIOLATION: 3.266112891926208

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.05399167+0.15431562j]
 [0.86823263+0.46844817j]
 [0.          +0.j          ]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```

Qobj data =
[[0.43532018+0.08298962j]
 [0.06834814+0.47283917j]
 [0.59778263+0.46692252j]
 [0.          +0.j          ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.17767531+0.78709297j]
 [-0.34601546+0.11943208j]
 [ 0.01082215+0.44476944j]
 [ 0.12457038+0.03834933j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.60603428-0.34328207j]
 [ 0.03450596-0.14383814j]
 [-0.27602719-0.5836124j ]
 [-0.19108725+0.19922605j]]

```

———— Run time is 3401.8408851623535 seconds ————

4.37 Equation 97

4.37.1 Qbits

$$h^{(97)}(\vec{r}) = 3.606333 > 3 \quad (92)$$

———— RESULTS ————

VIOLATION: 3.606333244740183

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[-0.18693845-0.00457998j]
 [-0.91425303-0.35940846j]]

```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.15361202+0.94173161j \\ -0.16324909+0.25078807j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.23572768-0.43224857j \\ -0.35086687-0.79654634j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.05341727-0.77043325j \\ 0.05533737-0.6328641j \end{bmatrix}$

———— Run time is 7697.501298666 seconds ————

4.37.2 Qtrits

$$h^{(97)}(\vec{r}) = 3.5370 > 3 \quad (93)$$

———— RESULTS ————

VIOLATION: 3.5370833276749085

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.16955195+0.18049446j \\ 0.49821262+0.83093807j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[ -0.11172558+0.69251892j ]
 [ -0.19260425-0.11206583j ]
 [  0.66105728+0.14588715j ]]

```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[ -0.2017956 +0.40977708j ]
 [ -0.1549917 -0.26363094j ]
 [  0.82928419+0.10062464j ]]

```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[ -0.36830147+0.73853536j ]
 [ -0.45809721+0.11859373j ]
 [  0.30820601-0.00332814j ]]

```

———— Run time is 1893.96431016922 seconds ————

4.37.3 Qquarts

$$h^{(97)}(\vec{r}) = 3.2916 > 3 \quad (94)$$

———— RESULTS ————

VIOLATION: 3.2916300634306213

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 1.]
 [ 0.]
 [ 0.]
 [ 0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 0.20060562+0.29041195j ]
 [ 0.52909945+0.77166836j ]
 [ 0.          +0.j         ]
 [ 0.          +0.j         ]]

```

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.36784094+0.3108381j \\ 0.01608616+0.13769971j \\ 0.75392415+0.42479537j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.26913098+0.51206261j \\ -0.44648921+0.27381839j \\ -0.26042374+0.56629809j \\ 0.04855568-0.01263226j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.34214689+0.78561856j \\ 0.07394164+0.42878248j \\ 0.1591843 +0.1245958j \\ -0.03501234-0.18527706j \end{bmatrix}$

———— Run time is 2051.312730550766 seconds ————

4.38 Equation 98

4.38.1 Qbits

$$h^{(98)}(\vec{r}) = 3.6139 > 3 \quad (95)$$

———— RESULTS ————

VIOLATION: 3.613977321763681

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =

```
[[0.42811381-0.20702742j]
 [0.7622782 -0.43907875j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.89256887+0.05058965j]
 [ -0.39288042+0.21542164j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.07024023+0.19708442j]
 [-0.59437374+0.77649462j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.70072133-0.32233984j]
 [-0.58276028-0.25588492j]]
```

———— Run time is 2787.4580116271973 seconds ————

4.38.2 Qtrits

$$h^{(98)}(\vec{r}) = 3.5647 > 3 \quad (96)$$

———— RESULTS ————

VIOLATION: 3.564780314667092

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.12444131+0.34906658j]
 [0.79483643+0.48052256j]
 [0.          +0.j          ]]
```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.10445383-0.78719632j \\ -0.22356426-0.49849486j \\ 0.26362821+0.03786047j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.2951106 +0.0004022j \\ -0.75082944-0.02783701j \\ -0.44908727+0.383028j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59414969+0.45083091j \\ -0.47798684+0.36207352j \\ -0.15828853+0.24313314j \end{bmatrix}$

———— Run time is 3978.6319522857666 seconds ————

4.38.3 Qquarts

$$h^{(98)}(\vec{r}) = 3.4363 > 3 \quad (97)$$

———— RESULTS ————

VIOLATION: 3.436365005497612

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.49469239+0.16635007j \end{bmatrix}$

```
[0.85224797+0.03578398j]
[0.          +0.j      ]
[0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.26955081+0.65906376j]
 [0.38756579+0.57019193j]
 [0.10097559+0.08634334j]
 [0.          +0.j      ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.3662945 -0.03780585j]
 [ 0.05574508-0.45953988j]
 [-0.46955677+0.11489538j]
 [-0.1125659  +0.63542038j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.43725147-0.55708033j]
 [ 0.09662436-0.62006529j]
 [-0.18996931-0.03450101j]
 [ 0.10946425+0.23536002j]]
```

———— Run time is 1837.4128148555756 seconds ————

4.39 Equation 99

4.39.1 Qbits

$$h^{(99)}(\vec{r}) = 3.6102 > 3 \quad (98)$$

———— RESULTS ————

VIOLATION: 3.610244540354779

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.51183148-0.17447912j \\ 0.41038525-0.73428164j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.86908892+0.22471205j \\ 0.19782611-0.39376867j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24580844+0.81871547j \\ -0.46010273-0.23997639j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.63754699+0.69519265j \\ -0.24555094-0.22348548j \end{bmatrix}$

———— Run time is 4404.830186843872 seconds ————

4.39.2 Qtrits

$$h^{(99)}(\vec{r}) = 3.617 > 3 \quad (99)$$

———— RESULTS ————

VIOLATION: 3.617327696687278

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.32949402+0.22927821j]
 [0.74936421+0.52661036j]
 [0.          +0.j          ]]

```

This is vector C:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.2702217 +0.57900777j]
 [-0.1613112 +0.09987389j]
 [ 0.71176988-0.22162531j]]

```

This is vector D:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.62558509+0.528289j   ]
 [ 0.47270281+0.05138348j]
 [-0.22274123+0.23206068j]]

```

This is vector E:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.72331612-0.04814242j]
 [ 0.60555923+0.01692185j]
 [-0.04889709-0.32421727j]]

```

———— Run time is 6861.144723176956 seconds ————

4.39.3 Qquarts

$$h^{(99)}(\vec{r}) = 3.3373 > 3 \quad (100)$$

———— RESULTS ————

VIOLATION: 3.337385611478963

This is vector A:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.03820473+0.26708773j]
 [0.95713647+0.10532953j]
 [0.          +0.j         ]
 [0.          +0.j         ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.3565489 +0.0765385j ]
 [0.02679408+0.01483338j]
 [0.352069  +0.86146632j]
 [0.          +0.j         ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.80316202+0.26070184j]
 [-0.06812111-0.31319727j]
 [ 0.02014168-0.03128197j]
 [ 0.1772783  +0.38912782j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.70139293+0.1728116j ]
 [ 0.1305937  +0.53772922j]
 [-0.31195641-0.19222112j]
 [-0.18866888+0.04598884j]]
```

———— Run time is 343.70030665397644 seconds ————

4.40 Equation 100

4.40.1 Qbits

$$h^{(100)}(\vec{r}) = 3.4256 > 3$$

$$h^{(100)}(\vec{r}) = 3.5124 > 3$$

$$h^{(100)}(\vec{r}) = 3.518 > 3$$

$$h^{(100)}(\vec{r}) = 3.623 > 3 \tag{101}$$

RESULTS

VIOLATION: 3.425674894549456

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.39501411 - 0.08313871j \\ -0.63374331 - 0.65986455j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.83427046 - 0.48507544j \\ -0.12223439 + 0.23184774j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.28278616 + 0.73544851j \\ -0.45410725 + 0.41585344j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.50740164 + 0.04213235j \\ -0.84804944 - 0.14690333j \end{bmatrix}$

Run time is 72.22319054603577 seconds

RESULTS

VIOLATION: 3.5124420377039116

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

[0.]]

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[0.45221205-0.13724999j]
[-0.78750624+0.3956016j]]

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[-0.18552743+0.82454265j]
[0.22219504+0.48614643j]]

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[0.70863352-0.41487261j]
[-0.56919508-0.04166788j]]

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[0.16138622-0.7015461j]
[-0.11079296+0.68520981j]]

———— Run time is 130.68006038665771 seconds ————

———— RESULTS ————

VIOLATION: 3.5188934874961513

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[1.]
[0.]]

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[-0.41733903-0.24789801j]
[0.85809181-0.16749078j]]

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.86984749+0.19424101j \\ 0.43186249-0.13831327j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.94801409-0.27703731j \\ -0.05507134+0.14658364j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.86785938-0.03676507j \\ 0.49101534-0.06612381j \end{bmatrix}$

———— Run time is 255.49816012382507 seconds ————

———— RESULTS ————

VIOLATION: 3.6231896605743827

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.53469415-0.16421643j \\ 0.78843053-0.25595395j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.5419405 -0.67771016j \\ 0.14526605-0.47529697j \end{bmatrix}$

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.94915318+0.02178614j]
 [ 0.16172952-0.26921584j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.3469357+0.72054212j]
 [-0.5253592-0.29060693j]]
```

———— Run time is 471.1423954963684 seconds ————

4.40.2 Qtrits

$$h^{(100)}(\vec{r}) = 3.214 > 3$$

$$h^{(100)}(\vec{r}) = 3.268 > 3$$

$$h^{(100)}(\vec{r}) = 3.338 > 3$$

$$h^{(100)}(\vec{r}) = 3.4158 > 3 \tag{102}$$

———— RESULTS ————

```
VIOLATION: 3.214101577598633
```

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.16044996+0.16073676j]
 [0.20906115+0.95116399j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
```

```
[[ 0.31798475+0.2422802j ]
 [ 0.19389873-0.73697441j]
 [-0.29032553+0.41853208j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.31577984-0.09542312j]
 [ 0.21382076-0.89564345j]
 [-0.10597082+0.1790285j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.82991666+0.3141239j ]
 [0.03431522+0.40131084j]
 [0.07911063-0.20994785j]]
```

———— Run time is 11.966550350189209 seconds ————

———— RESULTS ————

VIOLATION: 3.2683180405947097

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.66835784+0.10284501j]
 [0.02286736+0.7363408j ]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.31492729-0.15252339j]
 [-0.50294292-0.46343956j]
 [-0.6319973  +0.10202464j]]
```

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.51039379 - 0.62001391j \\ 0.30574286 - 0.50224293j \\ 0.08550312 - 0.04520492j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.62339387 - 0.65792354j \\ 0.37316065 + 0.18040141j \\ -0.00566224 - 0.08179913j \end{bmatrix}$

———— Run time is 26.231179237365723 seconds ————

———— RESULTS ————

VIOLATION: 3.3380337634625548

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.17880609 + 0.20408872j \\ 0.77045664 + 0.57686458j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.73051571 - 0.22908931j \\ 0.00212011 - 0.32013097j \\ 0.30235779 - 0.468995j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[ -0.74992549+0.23512985j ]  
 [ -0.19654449+0.49472486j ]  
 [ -0.31410549+0.01676371j ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.62104239+0.25217224j ]  
 [ -0.37247327+0.32920273j ]  
 [  0.21640841-0.50672689j ]]
```

———— Run time is 137.01724815368652 seconds ————

———— RESULTS ————

VIOLATION: 3.4158131100121008

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 1.]  
 [ 0.]  
 [ 0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.3560935 +0.09024959j ]  
 [ 0.61582687+0.6970005j  ]  
 [ 0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.54386164-0.22781712j ]  
 [ 0.06560222-0.07129067j ]  
 [-0.57426935-0.55959144j ]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.52620852+0.66956602j ]  
 [ -0.25065468+0.43547924j ]  
 [ 0.13832425-0.05641281j ]]
```

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.07277637+0.86572826j \\ 0.15480558+0.40157743j \\ -0.19099548-0.15332871j \end{bmatrix}$

———— Run time is 460.2683606147766 seconds ————

4.40.3 Qquarts

$$h^{(100)}(\vec{r}) = 3.00856 > 3 \quad (103)$$

———— RESULTS ————

VIOLATION: 3.0085671184199683

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.10808097+0.03915744j \\ 0.84836834+0.51677496j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.38173051+0.63920136j \\ 0.20095704+0.00661527j \\ 0.35574999+0.52793739j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.8044141 +0.2702492j \end{bmatrix}$

```

[-0.11662919+0.0822033j ]
[-0.19466267+0.32900198j]
[ 0.24614448+0.22978385j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[-0.86961234+0.01263285j]
 [-0.14859133-0.21239522j]
 [ 0.08834712+0.10630343j]
 [ 0.31610216+0.23957768j]]

```

———— Run time is 677.1650311946869 seconds ————

4.41 Equation 101

4.41.1 Qbits

$$h^{(101)}(\vec{r}) = 3.0743 > 3$$

$$h^{(101)}(\vec{r}) = 3.1591 > 3$$

$$h^{(101)}(\vec{r}) = 3.5228 > 3$$

$$h^{(101)}(\vec{r}) = 3.5242 > 3 \tag{104}$$

———— RESULTS ————

VIOLATION: 3.074387076779996

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[-0.21054847-0.46668389j]
 [ 0.85616366-0.06970857j]]

```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.15203869-0.97692921j]
 [0.09563006+0.11553545j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.64489161-0.44301265j]
 [-0.06905155+0.61893981j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.38137391+0.30737325j]
 [-0.85435645-0.17363955j]]
```

———— Run time is 1.232316493988037 seconds ————

———— RESULTS ————

VIOLATION: 3.1591875204774946

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.32364562+0.3163197j ]
 [-0.6238925 +0.63714481j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.61861221+0.72373698j]
 [0.2694368 -0.1446635j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.2722322+0.88214601j]
 [-0.3758211+0.08041483j]]
```

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.21046304+0.08273401j \\ 0.50569087-0.83254858j \end{bmatrix}$

———— Run time is 2.3585970401763916 seconds ————

———— RESULTS ————

VIOLATION: 3.522891211215505

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.0469211 +0.0050721j \\ -0.56454203+0.82405399j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.90905037-0.19669178j \\ 0.11488713+0.34891362j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.40015612-0.53747041j \\ -0.67328623+0.31254807j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24649569+0.14663787j \\ 0.95683172+0.04701341j \end{bmatrix}$

———— Run time is 7.800142765045166 seconds ————

RESULTS

VIOLATION: 3.5242642238612207

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.12403452 - 0.08764355j \\ 0.19417546 + 0.96913876j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.66412086 + 0.7269504j \\ -0.14978437 - 0.08972871j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.26429928 + 0.85707024j \\ 0.03525892 - 0.44083252j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.18797673 - 0.55540117j \\ -0.33822039 + 0.7360715j \end{bmatrix}$

Run time is 844.8883309364319 seconds

4.41.2 Qtrits

$$h^{(101)}(\vec{r}) = 3.2686 > 3$$

$$h^{(101)}(\vec{r}) = 3.3537 > 3$$

$$h^{(101)}(\vec{r}) = 3.4627 > 3$$

(105)

RESULTS

VIOLATION: 3.2686982545399736

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.16488844+0.06255332j \\ 0.42094976+0.88977535j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.7573702 +0.25476837j \\ -0.17319386-0.05620889j \\ 0.57262634-0.0206635j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.9172278 +0.14605093j \\ 0.21562068-0.01299038j \\ -0.2992252 +0.03414015j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.14545205-0.21607234j \\ -0.09376513+0.38573069j \\ 0.7218025 -0.50356482j \end{bmatrix}$

Run time is 56.03905177116394 seconds

RESULTS

VIOLATION: 3.3537471774021905

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.44717111+0.04893585j \\ 0.73466312+0.50785173j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11006197+0.45130769j \\ 0.15290472-0.04035665j \\ 0.68760405+0.53516343j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.27869187+0.70855437j \\ -0.30322566+0.56689909j \\ -0.04221869+0.07196355j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.06854753+0.19684896j \\ 0.55712573+0.38010443j \\ 0.05632911+0.70605262j \end{bmatrix}$

———— Run time is 73.31645655632019 seconds ————

———— RESULTS ————

VIOLATION: 3.4627033363666153

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.08898663+0.23243762j]
 [0.58946375+0.76849633j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.31034932+0.29543153j]
 [0.00878113-0.04134416j]
 [0.42908006-0.79404494j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.18967188-0.61593224j]
 [0.07945045-0.56562261j]
 [-0.42118054-0.28463606j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.3192229 +0.20334206j]
 [-0.14139309+0.04984698j]
 [0.22894395+0.88422661j]]

———— Run time is 557.7012982368469 seconds ————

4.41.3 Qquarts

$$\begin{aligned}h^{(101)}(\vec{r}) &= 3.02679 > 3 \\h^{(101)}(\vec{r}) &= 3.230 > 3 \\h^{(101)}(\vec{r}) &= 3.2449 > 3\end{aligned}\tag{106}$$

———— RESULTS ————

VIOLATION: 3.0267913137949027

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.51973435+0.42363518j]  
 [0.6284313 +0.39431401j]  
 [0.          +0.j      ]  
 [0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.38731067+0.07896895j]  
 [0.28406157+0.16069803j]  
 [0.29135339+0.80768355j]  
 [0.          +0.j      ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.59749594+0.63840977j]  
 [0.26082003+0.20971299j]  
 [0.02412128+0.28855289j]  
 [0.1019916 -0.17081581j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.20688401+0.23785758j]  
 [ 0.18248126+0.70254631j]  
 [-0.07786639+0.5857436j]  
 [ 0.15638792-0.01166737j]]
```

———— Run time is 10.18804407119751 seconds ————

———— RESULTS ————

VIOLATION: 3.2302711384444387

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.04401768+0.35988016j]
 [0.32767815+0.87245387j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.48044861+0.02764948j]
 [0.19067277+0.3400813j ]
 [0.47595927+0.62438451j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.60832956-0.39465737j]
 [0.51421449+0.10289776j]
 [0.25459252+0.36235964j]
 [0.05145321-0.02017238j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.37524113+0.02259019j]
 [ -0.12466411-0.41153208j]
 [ -0.05215934-0.78622346j]
 [  0.07897975-0.21605152j]]
```

———— Run time is 464.6267237663269 seconds ————

———— RESULTS ————

VIOLATION: 3.244977041381192

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.43815958+0.17212245j]  
 [0.49950602+0.72724396j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.52631584+0.45932747j]  
 [0.22472337+0.17161845j]  
 [0.39200008+0.52762901j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.65812537-0.41822942j]  
 [-0.10495284-0.50518392j]  
 [-0.1129748  -0.32159748j]  
 [ 0.09474232-0.02376768j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.29845624+0.51120008j]  
 [-0.4046552  +0.26108738j]  
 [-0.36376159+0.51631996j]  
 [ 0.13693026+0.00521614j]]
```

———— Run time is 5586.126786470413 seconds ————

4.42 Equation 102

4.42.1 Qbits

$$h^{(102)}(\vec{r}) = 3.474 > 3$$

$$h^{(102)}(\vec{r}) = 3.5152 > 3$$

$$h^{(102)}(\vec{r}) = 3.5714 > 3$$

$$h^{(102)}(\vec{r}) = 3.6125 > 3 \tag{107}$$

RESULTS

VIOLATION: 3.474433788008467

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.29961171+0.01723976j \\ -0.25005566+0.92054755j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.77928946+0.00840721j \\ -0.31961275-0.53896655j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.62170653-0.23240007j \\ -0.72814632+0.17109688j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.19554116+0.36384058j \\ -0.52370247+0.74506336j \end{bmatrix}$

———— Run time is 25.572491884231567 seconds ————

———— RESULTS ————

VIOLATION: 3.5152050864210462

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.14163453+0.35323589j \\ 0.26181284+0.88691493j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59086749-0.59491533j \\ -0.4945436-0.22886238j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.52203636+0.16324366j \\ 0.03724573+0.83632667j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.14429155+0.21859642j \\ 0.94761525-0.18281383j \end{bmatrix}$

———— Run time is 71.79470229148865 seconds ————

———— RESULTS ————

VIOLATION: 3.571402689150003

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.37399039-0.28465223j]
 [-0.87079527+0.14429103j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.77110906-0.30957443j]
 [-0.43921661-0.34153077j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.69655165-0.21537296j]
 [ 0.55243693+0.40403431j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.06916611+0.2313509j ]
 [-0.36320342-0.89987559j]]
```

———— Run time is 271.3051462173462 seconds ————

———— RESULTS ————

VIOLATION: 3.61251339389964

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
```

```
[[ 0.15987237-0.3956255j ]
 [-0.01409715+0.90428013j ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.79070402+0.4381616j ]
 [ 0.09498377-0.41686887j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.29027071+0.67754942j ]
 [ 0.04744811-0.67410561j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.13802881+0.12744054j ]
 [-0.63937535-0.74559112j ]]
```

———— Run time is 3978.942038297653 seconds ————

4.42.2 Qtrits

$$h^{(102)}(\vec{r}) = 3.168 > 3$$

$$h^{(102)}(\vec{r}) = 3.3078 > 3$$

$$h^{(102)}(\vec{r}) = 3.372 > 3$$

$$h^{(102)}(\vec{r}) = 3.374 > 3$$

$$h^{(102)}(\vec{r}) = 3.379 > 3$$

(108)

———— RESULTS ————

VIOLATION: 3.168157564961863

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 1.]
 [ 0.]
```

[0.]

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.24434007+0.39640081j \\ 0.86770646+0.17392478j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.0670315 -0.35992921j \\ -0.80862512-0.34752451j \\ -0.2728822 -0.12978893j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.50587148+0.68518547j \\ 0.27521746+0.05755371j \\ -0.38565372-0.21640019j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.55995547+0.17436805j \\ -0.01700417-0.01831724j \\ -0.5988162 +0.54483039j \end{bmatrix}$

Run time is 402.6299612522125 seconds

RESULTS

VIOLATION: 3.307815596562537

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.22444761+0.37195235j]
 [0.40828504+0.80285618j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.10282256+0.81975948j]
 [-0.47504142+0.24284576j]
 [-0.16086165-0.08310852j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.06594847+0.74345716j]
 [-0.08155897+0.43369545j]
 [ 0.25466641+0.42816313j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.14544283+0.20612649j]
 [0.41657263+0.42072565j]
 [0.76382804+0.04880725j]]
```

———— Run time is 566.8159668445587 seconds ————

———— RESULTS ————

VIOLATION: 3.3728873799739434

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.14153113+0.35598919j]
 [0.11510657+0.91651029j]]
```



```
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.37452779+0.75898448j]
 [ 0.13970944+0.35887119j]
 [-0.09786045-0.35466542j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.23206964-0.66509063j]
 [ 0.28491243-0.63440782j]
 [-0.04292023+0.13530564j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.09755674+0.13893184j]
 [-0.93865603+0.14049598j]
 [ 0.14075425-0.22484351j]]
```

———— Run time is 714.7895596027374 seconds ————

———— RESULTS ————

VIOLATION: 3.37428505507907

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.37461253+0.31716594j]
 [0.66388608+0.56420431j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.37270447+0.359999j ]
 [0.73903268+0.36509695j]
 [0.03167038+0.22588492j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.35683657-0.67971374j]
 [-0.31426251-0.48306092j]
 [ 0.24728095+0.13191001j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.0923725 -0.41954591j]
 [ 0.22898889-0.10691908j]
 [-0.69136558+0.5230627j ]]
```

———— Run time is 860.6917607784271 seconds ————

———— RESULTS ————

VIOLATION: 3.37928050508373

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.22777703+0.27253701j]
 [0.67405564+0.64768063j]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.10590265+0.22667644j]
 [-0.51915852+0.79733731j]]
```

$[-0.17662894+0.03053332j]$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.59495258+0.11843404j \\ 0.58442471-0.37178661j \\ -0.19190406-0.33970592j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.02324285-0.26611676j \\ 0.01433319-0.40161674j \\ -0.85628579+0.18415984j \end{bmatrix}$

———— Run time is 1244.3738250732422 seconds ————

4.42.3 Qquarts

$$h^{(102)}(\vec{r}) = 3.0843 > 3$$

$$h^{(102)}(\vec{r}) = 3.2962 > 3$$

$$h^{(102)}(\vec{r}) = 3.3403 > 3 \tag{109}$$

———— RESULTS ————

VIOLATION: 3.08438521324718

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.46869738+0.27023745j \\ 0.60172454+0.58755601j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.36040908+0.06037532j]
 [0.62329415+0.68575996j]
 [0.00934617+0.08723793j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.10807261+0.81805203j]
  [-0.07585681+0.47784927j]
  [ 0.12334542+0.07469281j]
  [ 0.11975137-0.22334615j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [-0.346293   -0.0571744j ]
  [-0.22491217+0.34347481j]
  [ 0.45794905+0.47592715j]
  [ 0.41556146+0.31517694j ]]
```

———— Run time is 19.33393907546997 seconds ————

———— RESULTS ————

VIOLATION: 3.296240172583183

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.2854338 +0.10945798j]
 [0.81235967+0.49660675j]
 [0.          +0.j          ]]
```

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.55073065+0.31010212j]
 [0.65259906+0.27737937j]
 [0.06558849+0.30562351j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.74951663+0.03444451j]
 [0.59852165-0.18544905j]
 [0.0270104  -0.058921j  ]
 [0.11373432+0.16517305j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.32135875-0.30198709j]
 [ 0.26027089-0.29082201j]
 [-0.49889842+0.10216181j]
 [ 0.27315169+0.5650358j ]]
```

———— Run time is 118.17477369308472 seconds ————

———— RESULTS ————

VIOLATION: 3.3403742154281297

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.2481348  +0.24474665j]
 [0.55112087+0.75815169j]
```

```
[0.          +0.j          ]
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.36968743+0.58730947j]
 [0.45890144+0.54167602j]
 [0.02132027+0.11807117j]
 [0.          +0.j          ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.67809455-0.20322301j]
 [ 0.50167796-0.37676755j]
 [-0.11802803-0.09094199j]
 [-0.12419017+0.26005647j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.25952282+0.10791613j]
 [-0.56978877-0.19123512j]
 [-0.13552716+0.29925149j]
 [ 0.55730535-0.37585049j]]
```

———— Run time is 444.2043409347534 seconds ————

4.43 Equation 103

4.43.1 Qbits

$$\begin{aligned}
h^{(103)}(\vec{r}) &= 3.172 > 3 \\
h^{(103)}(\vec{r}) &= 3.195 > 3 \\
h^{(103)}(\vec{r}) &= 3.210 > 3 \\
h^{(103)}(\vec{r}) &= 3.40 > 3 \\
h^{(103)}(\vec{r}) &= 3.448 > 3 \\
h^{(103)}(\vec{r}) &= 3.483 > 3 \\
h^{(103)}(\vec{r}) &= 3.608 > 3
\end{aligned} \tag{110}$$

———— RESULTS ————

VIOLATION: 3.1721375092895037

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.51694934+0.15033916j \\ 0.01973927+0.8424796j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.78339604+0.08453937j \\ -0.32929028+0.52029959j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.61690346-0.61996786j \\ 0.17565123+0.45190333j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.39039357-0.72566095j \\ -0.19598839+0.5315991j \end{bmatrix}$

———— Run time is 1.6577715873718262 seconds ————

———— RESULTS ————

VIOLATION: 3.195336502166115

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.05755985-0.44754775j \\ -0.0403148-0.89149458j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.61074124-0.76704741j \\ -0.11809204-0.15712314j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.03268646+0.61185033j \\ -0.78385169-0.10073378j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.64196114+0.45164054j \\ -0.61442406-0.07993619j \end{bmatrix}$

———— Run time is 2.081963062286377 seconds ————

———— RESULTS ————

VIOLATION: 3.210475651646913

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52832925-0.15307802j \\ 0.83363283+0.04991631j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket


```
Qobj data =  
[[-0.18311486+0.68065946j]  
 [-0.32192273+0.63208971j]]
```

```
This is vector D:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.77138075-0.31034098j]  
 [ 0.36939016+0.41498329j]]
```

```
This is vector E:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.57854944+0.70031607j]  
 [-0.2346202 +0.3461088j ]]
```

```
———— Run time is 3.1362993717193604 seconds ————
```

```
———— RESULTS ————
```

```
VIOLATION: 3.408732475831832
```

```
This is vector A:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]]
```

```
This is vector B:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.20338728-0.12247864j]  
 [-0.97129331+0.0148965j ]]
```

```
This is vector C:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.31514128-0.79836946j]  
 [-0.35688141+0.36868393j]]
```

```
This is vector D:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.19764536-0.916096j ]
```

[0.19800552-0.28722507j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.00610659+0.93248205j]
[0.05530221-0.35690559j]]

———— Run time is 3.6623597145080566 seconds ————

———— RESULTS ————

VIOLATION: 3.411243743491803

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[1.]
[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.17115812-0.39635335j]
[-0.8739255 +0.22330057j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.73775231+0.54895802j]
[0.27332976+0.28223652j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[-0.55576695-0.74271295j]
[0.1725769 -0.33123676j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

[[0.96438069+0.22332726j]
[0.0666665 -0.12510159j]]

———— Run time is 26.102238655090332 seconds ————

———— RESULTS ————

VIOLATION: 3.448506253541222

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.13194048+0.3331618j \\ -0.11956245+0.92590483j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.02349482-0.77981675j \\ 0.38939835-0.48959448j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.33121858-0.77007591j \\ -0.48693933+0.24529051j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.73513066-0.17752847j \\ -0.63143358+0.17134229j \end{bmatrix}$

———— Run time is 28.2775297164917 seconds ————

———— RESULTS ————

VIOLATION: 3.4831119771550396

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

```
Qobj data =  
[[1.]  
 [0.]]
```

```
This is vector B:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.04243042-0.41285347j]  
 [ 0.19650603+0.88833386j]]
```

```
This is vector C:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.62909362-0.11371712j]  
 [-0.67362985+0.3708537j ]]
```

```
This is vector D:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.69884605+0.50703378j]  
 [0.49289192-0.10764992j]]
```

```
This is vector E:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.44822913-0.67524823j]  
 [-0.57739476+0.09872066j]]
```

```
———— Run time is 49.870702505111694 seconds ————
```

```
———— RESULTS ————
```

```
VIOLATION: 3.6083149804822434
```

```
This is vector A:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]]
```

```
This is vector B:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.40594659+0.23311141j]
```

```
[0.39576302+0.79008738j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.79888682+0.22761538j]
 [0.21316743+0.51432552j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.89433818-0.13401797j]
 [ 0.14039355+0.40309807j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.91595695+0.02438762j]
 [-0.38054362-0.12495861j]]
```

———— Run time is 230.51142859458923 seconds ————

4.43.2 Qtrits

$$\begin{aligned}h^{(103)}(\vec{r}) &= 3.262 > 3 \\h^{(103)}(\vec{r}) &= 3.328 > 3 \\h^{(103)}(\vec{r}) &= 3.540 > 3\end{aligned}\tag{111}$$

———— RESULTS ————

VIOLATION: 3.2624301068693864

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.44981203+0.1576967j ]
 [0.48474254+0.73336591j]]
```

```
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.83973655+0.09640406j]
 [-0.27428989+0.32136928j]
 [ 0.14011648+0.29563998j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.46298563-0.53928804j]
 [ 0.17183151+0.08370558j]
 [-0.32357875+0.59462325j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.77515217+0.35069398j]
 [-0.0030007  +0.52444364j]
 [-0.0130377  +0.0305408j ]]
```

———— Run time is 8.04056191444397 seconds ————

———— RESULTS ————

VIOLATION: 3.3287292290994737

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.15442782+0.42272074j]
 [0.4810608  +0.75235612j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.79861842-0.43772165j]
 [ -0.23691977+0.22899509j]
 [ -0.24889739+0.00942062j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.31722806+0.35243167j]
 [ -0.23883454-0.1349443j ]
 [ -0.43450766+0.7149192j  ]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.81696988-0.31823493j]
 [ -0.40414945+0.23709797j]
 [ -0.01484503-0.10730398j]]
```

———— Run time is 42.8749783039093 seconds ————

———— RESULTS ————

VIOLATION: 3.5407608635742367

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.08706952+0.23456836j]
 [0.89270936+0.37478872j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.36000288+0.77907124j]
 [ 0.28677075+0.36006493j]
```

$[-0.01483203 - 0.22658711j]$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.54192995 - 0.24257777j \\ 0.10757286 + 0.11557375j \\ -0.18941235 - 0.76593844j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.68826329 - 0.44450775j \\ -0.46580065 - 0.12188569j \\ 0.01452121 - 0.31091683j \end{bmatrix}$

———— Run time is 156.08653116226196 seconds ————

4.43.3 Qquarts

$$h^{(103)}(\vec{r}) = 3.034 > 3$$

$$h^{(103)}(\vec{r}) = 3.061 > 3$$

$$h^{(103)}(\vec{r}) = 3.162 > 3$$

$$h^{(103)}(\vec{r}) = 3.2316 > 3$$

$$h^{(103)}(\vec{r}) = 3.2653 > 3$$

(112)

———— RESULTS ————

VIOLATION: 3.034096350952779

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.42275202 + 0.31916292j \\ 0.84735776 + 0.03742441j \\ 0. + 0.j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.18497681+0.81754419j]
 [0.26762177+0.34842403j]
 [0.12147864+0.29937818j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.04791401-0.18187945j]
 [  0.47508732+0.43881081j]
 [  0.10228242+0.42421402j]
 [  0.53307965-0.26789566j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.32512025+0.35439722j]
 [0.73714328+0.16138484j]
 [0.15958632+0.03256687j]
 [0.12889363-0.39513565j]]
```

———— Run time is 14.226820945739746 seconds ————

———— RESULTS ————

VIOLATION: 3.0614796249569447

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.29687492+0.03241691j]
 [0.62758546+0.71899298j]
```

```
[0.      +0.j      ]
[0.      +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.44840068+0.29600309j]
 [0.42961474+0.45855792j]
 [0.10915206+0.55187013j]
 [0.      +0.j      ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.43089118-0.57644128j]
 [-0.26245349+0.12570085j]
 [ 0.32156647+0.44742215j]
 [ 0.00933216+0.30608339j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.62265209+0.28751173j]
 [ 0.47256418+0.51282811j]
 [-0.06014537-0.0659707j ]
 [-0.18598437+0.02778538j]]
```

———— Run time is 24.937020778656006 seconds ————

———— RESULTS ————

VIOLATION: 3.162581885737264

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.19910828+0.01530646j]
```

```
[0.00177316+0.97985635j]
[0.          +0.j      ]
[0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.76673121+0.48373028j]
 [0.16449312+0.23513599j]
 [0.01381103+0.30917732j]
 [0.          +0.j      ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.51276572-0.02247133j]
 [  0.31156588+0.0859717j ]
 [  0.29164742+0.18626945j]
 [-0.53392582+0.47672908j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.60656489+0.30454883j]
 [  0.00575047-0.65452709j]
 [-0.13730309-0.24320624j]
 [  0.14278188+0.11181316j]]
```

———— Run time is 30.90617275238037 seconds ————

———— RESULTS ————

VIOLATION: 3.231603250442576

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.37952964+0.04544057j]
 [0.91493748+0.12954464j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.41163883+0.63711139j]
 [0.497695   +0.38563223j]
 [0.10343918+0.13240227j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.16410284+0.01499835j]
  [ 0.11851902-0.06899248j]
  [-0.32194501-0.7389171j ]
  [ 0.23471406+0.49930033j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[-0.16160343-0.76144177j]
 [-0.06623604-0.56032524j]
 [-0.11136124+0.23461708j]
 [ 0.07255689-0.0550289j ]]
```

———— Run time is 32.085148096084595 seconds ————

———— RESULTS ————

VIOLATION: 3.265362101408582

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.37240511+0.1386825j]
 [0.89036539+0.222106j ]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.64326994+0.50435005j]
 [0.3256336  +0.46004638j]
 [0.02352304+0.11662575j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.57489634+0.45898346j]
  [-0.12112404-0.14692422j]
  [ 0.36026674-0.22803975j]
  [-0.39119839-0.29620969j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.61880952+0.63219392j]
 [0.2719122  -0.01634206j]
 [0.13536761+0.0019113j ]
 [0.00199365-0.35336992j]]
```

———— Run time is 1142.3204584121704 seconds ————

4.44 Equation 104

4.44.1 Qbits

$$h^{(104)}(\vec{r}) = 3.5238 > 3$$

$$h^{(104)}(\vec{r}) = 3.5367 > 3$$

$$h^{(104)}(\vec{r}) = 3.5629 > 3$$

$$h^{(104)}(\vec{r}) = 3.5718 > 3$$

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———— RESULTS ————

VIOLATION: 3.5238635601714616

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.33870114-0.20851337j]
 [-0.45444108+0.79704894j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.69012965+0.68500418j]
 [0.16891912-0.16111073j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.96411068-0.04155579j]
 [0.1697771 +0.19984858j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.47267342+0.59322865j]
 [ 0.6499764 +0.04680048j]]
```

———— Run time is 318.33800864219666 seconds ————

———— RESULTS ————

VIOLATION: 3.5367806387669214

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
```

```
[[ 0.47211827+3.96345270e-04j]
 [-0.01593623-8.81391072e-01j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.83512216-0.47264182j]
 [ -0.23165599+0.15973786j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.1599386 -0.92679537j]
 [ 0.33256928+0.06976858j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.43325437-0.47451476j]
 [-0.36253551-0.6750514j]]
```

———— Run time is 396.4524164199829 seconds ————

———— RESULTS ————

VIOLATION: 3.5629156018302215

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 1.]
 [ 0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.42189996+0.03372935j]
 [ 0.88748179-0.18231517j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.72084531+0.54004576j]
 [ 0.42614303-0.08446735j]]
```

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.0212323 + 0.87936859j \\ 0.26044527 + 0.39803057j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.39711319 - 0.76992748j \\ -0.13171086 + 0.48183507j \end{bmatrix}$

———— Run time is 421.65815138816833 seconds ————

———— RESULTS ————

VIOLATION: 3.5718098251868104

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.21009216 + 0.34477951j \\ -0.82124696 - 0.40316473j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.47226432 - 0.83142135j \\ 0.28958724 - 0.04294401j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.74824451 + 0.5898082j \\ 0.26943748 - 0.1402137j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.66485951-0.27521975j \\ 0.29410899+0.62905948j \end{bmatrix}$

———— Run time is 469.0090522766113 seconds ————

4.44.2 Qtrits

$$\begin{aligned} h^{(104)}(\vec{r}) &= 3.203 > 3 \\ h^{(104)}(\vec{r}) &= 3.3012 > 3 \end{aligned} \tag{114}$$

———— RESULTS ————

VIOLATION: 3.2032961080922626

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.02291302+0.18669363j \\ 0.52503022+0.8300384j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.2992736 -0.66218796j \\ -0.52240687-0.42646375j \\ 0.12755856+0.02984884j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59984309-0.7381719j \\ 0.08240284+0.21067179j \\ 0.20986206+0.00869468j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.28033722 -0.52224335j]
 [ -0.32384782 -0.56195193j]
 [ -0.41464888 -0.23679496j]]
```

———— Run time is 107.23745322227478 seconds ————

———— RESULTS ————

VIOLATION: 3.301242540332047

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.33250319+0.08609309j]
 [0.57971363+0.73889222j]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -1.88764213e-01+0.71111058j]
 [ -5.90944671e-01+0.31585945j]
 [ -2.99879293e-04-0.09852374j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.34941675 -0.09103373j]
 [ -0.2656843  -0.03385093j]
 [ -0.87830407 +0.1626921j  ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.76585127-0.34832274j]
 [ 0.4640911 -0.00367542j]
 [-0.1207268 +0.24934731j]]
```

Run time is 135.53417992591858 seconds

4.44.3 Qquarts

$$\begin{aligned} h^{(104)}(\vec{r}) &= 3.176 > 3 \\ h^{(104)}(\vec{r}) &= 3.258 > 3 \end{aligned} \tag{115}$$

RESULTS

VIOLATION: 3.176372244562941

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.10448798+0.21540626j]
[0.89728693+0.37088889j]
[0. +0.j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.34674176+0.45091661j]
[0.00978826+0.77031335j]
[0.21292435+0.19398227j]
[0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.55580669+0.11458035j]
[-0.04154149+0.39873792j]
[0.56742726+0.43599406j]]

```
[ 0.04405309-0.05681064j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.32798222-0.4368097j ]
  [ 0.64621384-0.35040997j ]
  [-0.25524281+0.21679528j ]
  [-0.21086399+0.06806439j ]]
```

———— Run time is 72.0382330417633 seconds ————

———— RESULTS ————

VIOLATION: 3.258043334455442

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [1.]
  [0.]
  [0.]
  [0.] ]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [0.38521309+0.23910615j ]
  [0.87598883+0.16456822j ]
  [0.          +0.j         ]
  [0.          +0.j         ] ]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [0.75891435+0.51125798j ]
  [0.38121793+0.02503047j ]
  [0.00668572+0.12909666j ]
  [0.          +0.j         ] ]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [-0.74672756-0.00658604j ]
  [ 0.07864125+0.00197559j ]]
```

```
[ 0.14011879-0.51404143j]
[-0.35737658-0.15676843j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.27868204-0.87334105j]
[0.06288178-0.13962995j]
[-0.07378858-0.25959444j]
[-0.14862111-0.20307344j]]

———— Run time is 351.05399227142334 seconds ————

4.45 Equation 105

4.45.1 Qbits

$$h^{(105)}(\vec{r}) = 3.636853 > 3 \quad (116)$$

———— RESULTS ————

VIOLATION: 3.636853334553705

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.31434463+0.23360966j]
[0.68537805-0.61389813j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.26219858-0.68110757j]
[-0.04124681+0.68238045j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```
[[ 0.91030996+0.09179131j]
 [-0.39246319-0.0942485j  ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.51837064-0.78046616j]
 [-0.28810267-0.19789214j  ]]
```

———— Run time is 45508.38469719887 seconds ————

4.45.2 Qtrits

$$h^{(105)}(\vec{r}) = 3.68885 > 3 \quad (117)$$

RESULTS

VIOLATION: 3.688857179847065

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.08640181+0.32360338j]
 [0.65052725+0.68163764j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.32543086+0.86119397j]
 [ 0.3169187 +0.07084161j]
 [-0.01450876-0.21627112j  ]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.47243301+0.46364303j]
```

```
[ 0.04068844+0.67809331j]
[-0.30666022-0.07959657j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[ 0.34158708-0.09826251j]
[-0.08907297-0.23084314j]
[ 0.85096695+0.29714549j]]
```

———— Run time is 936.111430644989 seconds ————

———— Run time is 13997.917264699936 seconds ————

4.45.3 Qquarts

$$h^{(105)}(\vec{r}) = 3.38114 > 3 \quad (118)$$

RESULTS

VIOLATION: 3.38114609709629

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[1.]
[0.]
[0.]
[0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.0752331 +0.27751668j]
 [0.68910831+0.66517232j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.47924548+0.47023965j]
 [0.39648262+0.52455838j]
 [0.08968487+0.32984102j]
 [0.          +0.j        ]]
```

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59361887-0.24758764j \\ -0.68822777+0.00102744j \\ -0.13922035+0.13561766j \\ -0.27355083+0.00734614j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33042481-0.67307647j \\ -0.01350123+0.10155723j \\ -0.14469934+0.38575729j \\ -0.50238482-0.07179313j \end{bmatrix}$

———— Run time is 904.519284248352 seconds ————

4.46 Equation 106

4.46.1 Qbits

$$h^{(106)}(\vec{r}) = 3.612323 > 3 \quad (119)$$

RESULTS

VIOLATION: 3.6123236790788815

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.38722288+0.22044186j \\ 0.87179375+0.20356689j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.80365029+0.41308303j \end{bmatrix}$

```
[ 0.35798127+0.23528287j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.03770758-0.79498621j]
 [-0.41066097+0.44489621j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.89647461+0.15447544j]
 [-0.40627956-0.08606703j]]
```

———— Run time is 2388.432512998581 seconds ————

4.46.2 Qtrits

$$h^{(106)}(\vec{r}) = 3.56234 > 3 \quad (120)$$

———— RESULTS ————

VIOLATION: 3.562346139563239

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.04192363+0.22089819j]
 [0.97074678+0.08424417j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.82094006-0.16116079j]
 [-0.03696684+0.51208149j]
 [ 0.15340104-0.11383642j]]
```

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.56999005-0.73034068j \\ -0.2832301+0.10052758j \\ -0.1281691-0.18697973j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.26892844-0.63558166j \\ -0.15088691-0.0354157j \\ 0.47074648+0.52734246j \end{bmatrix}$

Run time is 2706.33806180954 seconds

4.46.3 Qquarts

$$h^{(106)}(\vec{r}) = 3.3975 > 3 \quad (121)$$

RESULTS

VIOLATION: 3.3975172602227146

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.29691335+0.10302496j \\ 0.40188431+0.86006821j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52965028+0.34036996j \end{bmatrix}$

```
[0.49926741+0.53464602j]
[0.25521318+0.05805849j]
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.06588209-0.88875923j]
 [ 0.21141396-0.22198849j]
 [-0.28162752+0.16996629j]
 [-0.02991862-0.05190472j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.33638748-0.49799089j]
 [-0.0979317  -0.12324437j]
 [ 0.06817347-0.77668924j]
 [ 0.00520904+0.07840803j]]
```

———— Run time is 975.7447502613068 seconds ————

4.47 Equation 107

4.47.1 Qbits

$$h^{(107)}(\vec{r}) = 3.60003 > 3 \quad (122)$$

RESULTS

VIOLATION: 3.6000380516325263

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.49060494+0.22245469j]
 [0.72526022-0.42874039j]]
```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.35177154 - 0.63994973j \\ -0.36052166 - 0.58029755j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.05093822 - 0.17195043j \\ -0.8618273 - 0.47443867j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.27357597 + 0.92979943j \\ 0.22857286 + 0.0915623j \end{bmatrix}$

———— Run time is 1302.5832600593567 seconds ————

4.47.2 Qtrits

$$h^{(107)}(\vec{r}) = 3.54749 > 3 \quad (123)$$

———— RESULTS ————

VIOLATION: 3.5474924590920427

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.01391299 + 0.37087215j \\ 0.53940835 + 0.75584318j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[0.61017565+0.17779311j]
 [0.73343483+0.10748264j]
 [0.1104962 -0.18543653j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.04575949+0.05362239j]
 [0.39600405+0.66897228j]
 [0.60803533+0.14484691j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.63414546-0.17793609j]
 [-0.55925528+0.19645748j]
 [ 0.25076622-0.38981096j]]
```

———— Run time is 3352.09433221817 seconds ————

4.47.3 Qquarts

$$h^{(107)}(\vec{r}) = 3.3867 > 3 \quad (124)$$

———— RESULTS ————

VIOLATION: 3.386768881311614

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.28817155+0.33520468j]
 [0.76839979+0.46277073j]
 [0.          +0.j          ]
 [0.          +0.j          ]]
```

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.3685953 +0.6039724j ]
 [0.28165812+0.58709735j]
 [0.2708356 +0.04459061j]
 [0.          +0.j       ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.2653699 -0.07826475j]
 [-0.630364  -0.22675223j]
 [-0.13853705+0.52410151j]
 [-0.36108694+0.22454267j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.2308995 +0.48580332j]
 [ 0.69607549+0.12011546j]
 [-0.01238365+0.37727926j]
 [-0.16802197+0.20250275j]]

```

———— Run time is 722.6257429122925 seconds ————

4.48 Equation 108

4.48.1 Qbits

$$h^{(108)}(\vec{r}) = 3.62392 > 3 \quad (125)$$

———— RESULTS ————

VIOLATION: 3.6239283156816606

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```

```
[[ -0.13763576+0.0480272j ]
 [  0.98689714-0.06916511j ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.17794155+0.67530449j ]
 [ -0.53204359-0.47877997j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[  0.01797164+0.4615723j ]
 [ -0.83286693-0.30489457j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.56606701-0.68457198j ]
 [ 0.30687802+0.34169464j ]]
```

———— Run time is 2378.7023298740387 seconds ————

4.48.2 Qtrits

$$h^{(108)}(\vec{r}) = 3.5578 > 3 \quad (126)$$

———— RESULTS ————

VIOLATION: 3.5578592376632487

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 1.]
 [ 0.]
 [ 0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.32517252+0.33859553j ]
 [ 0.45456406+0.75695932j ]
 [ 0.          +0.j          ]]
```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.75018005+0.42868634j \\ 0.26594244+0.32105602j \\ -0.18936456+0.20927644j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.46976051+0.0827837j \\ -0.46551965-0.03263513j \\ -0.32507607-0.67009244j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.66165941+0.2307852j \\ 0.16176629+0.10358718j \\ -0.1016523 +0.6794948j \end{bmatrix}$

———— Run time is 5029.872107505798 seconds ————

4.48.3 Qquarts

$$h^{(108)}(\vec{r}) = 3.43918 > 3 \quad (127)$$

———— RESULTS ————

VIOLATION: 3.439189439920847

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.03830687+0.22865378j \\ 0.62261534+0.74739559j \end{bmatrix}$

```
[0.          +0.j          ]
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.31003336+0.64067868j]
 [0.6670414 +0.01009677j]
 [0.07189332+0.20783484j]
 [0.          +0.j          ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.21074778-0.01670669j]
 [-0.24515168+0.55823612j]
 [-0.25645296-0.5496167j ]
 [ 0.22306792-0.40739835j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.47880331-0.35808593j]
 [-0.12564452-0.15628496j]
 [ 0.62581879+0.03075363j]
 [ 0.25840841+0.37807469j]]
```

———— Run time is 1003.9348771572113 seconds ————

4.49 Equation 109

4.49.1 Qbits

$$h^{(109)}(\vec{r}) = 3.60166 > 3 \quad (128)$$

———— RESULTS ————

VIOLATION: 3.6016650401969894

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.34687495-0.32009916j]
 [-0.02576526+0.881221j  ]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.62212142+0.46877447j]
 [0.08156551-0.6217415j  ]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.93901418+0.17130397j]
 [ 0.28835282+0.07589452j  ]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.1380844 +0.06122114j]
 [-0.17536599+0.97284708j  ]]

```

```

———— Run time is 0.3106226921081543 seconds ————

```

4.49.2 Qtrits

$$h^{(109)}(\vec{r}) = 3.61349 > 3 \quad (129)$$

RESULTS

VIOLATION: 3.6134988251368174

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

```

Qobj data =
[[0.18729685+0.1865913j ]
 [0.54462055+0.79592213j]
 [0.          +0.j       ]]

```

This is vector C:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.5382925 +0.28596285j]
 [ 0.5328987 +0.42866051j]
 [-0.39565667+0.06474081j]]

```

This is vector D:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.1693355 +0.65132355j]
 [-0.31875713+0.66456739j]
 [-0.05348372+0.03141177j]]

```

This is vector E:

```

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.09550873+0.03671725j]
 [-0.43548716-0.29050986j]
 [ 0.83918835-0.10605562j]]

```

———— Run time is 31420.53336429596 seconds ————

4.49.3 Qquarts

$$h^{(109)}(\vec{r}) = 3.4104 > 3 \quad (130)$$

———— RESULTS ————

VIOLATION: 3.4104609790151326

This is vector A:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.25733862+0.28281874j]
 [0.85558845+0.34893953j]
 [0.          +0.j        ]
 [0.          +0.j        ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.64784463+0.21696446j]
 [0.62963019+0.02447389j]
 [0.03274649+0.36758439j]
 [0.          +0.j        ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.06431748+0.74626891j]
 [ 0.45021235+0.36147714j]
 [ 0.14059267+0.06195805j]
 [-0.21716048-0.18661544j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.1165789 +0.13433891j]
 [-0.00942035+0.56473989j]
 [-0.80476609-0.02563667j]
 [ 0.03023978+0.01106319j]]

```

———— Run time is 13003.02240395546 seconds ————

4.50 Equation 110

4.50.1 Qbits

$$h^{(110)}(\vec{r}) = 3.590079 > 3 \quad (131)$$

———— RESULTS ————

VIOLATION: 3.590079658700625

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```

```
[[1.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.02133792+0.0648061j ]  
 [ 0.89204576-0.44676529j ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.33707611-0.66729074j ]  
 [-0.24521207+0.61723075j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.09569653-0.94480433j ]  
 [-0.25359305+0.18405847j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.46094371-0.24138534j ]  
 [-0.85024928-0.07962527j ]]
```

———— Run time is 5044.5287210941315 seconds ————

4.50.2 Qtrits

$$h^{(110)}(\vec{r}) = 3.64328 > 3 \quad (132)$$

———— RESULTS ————

VIOLATION: 3.6432896606637306

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.22909514+0.13656083j \\ 0.67757611+0.68538834j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.18772827-0.66787754j \\ 0.17873008-0.5857069j \\ -0.20490211+0.31892914j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.46075541-0.26706661j \\ 0.07883705-0.15522869j \\ -0.21270704+0.80051506j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.01989136+0.43745982j \\ -0.26429282+0.48936445j \\ 0.43630076-0.55546973j \end{bmatrix}$

———— Run time is 4931.749583005905 seconds ————

4.50.3 Qquarts

$$h^{(110)}(\vec{r}) = 3.4235924 > 3 \quad (133)$$

———— RESULTS ————

VIOLATION: 3.4235924840517242

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.0399742 + 0.16558196j] \\ [0.53116368 + 0.82996977j] \\ [0. + 0.j] \\ [0. + 0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.37968598 + 0.63522677j] \\ [0.23241354 + 0.59231189j] \\ [0.11748698 + 0.18350173j] \\ [0. + 0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.60446956 + 0.35155409j] \\ [-0.17178059 - 0.09591692j] \\ [-0.54065173 + 0.39134536j] \\ [-0.13820955 + 0.08809248j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.0187691 - 0.33853134j] \\ [-0.13151456 - 0.7091767j] \\ [-0.09322507 - 0.44724624j] \\ [0.00968386 - 0.39497174j] \end{bmatrix}$

———— Run time is 2757.759949684143 seconds ————

4.51 Equation 111

4.51.1 Qbits

$$h^{(111)}(\vec{r}) = 3.606844 > 3 \quad (134)$$

———— RESULTS ————

VIOLATION: 3.6068444779084734

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.45583758+0.69457591j \\ -0.4359001 +0.34607443j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.03994196-0.07318477j \\ 0.87696516+0.47326603j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.32700967-0.15574435j \\ 0.93034484+0.05715641j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.52076082+0.37760314j \\ -0.76394849+0.0510563j \end{bmatrix}$

———— Run time is 1333.104605436325 seconds ————

4.51.2 Qtrits

$$h^{(111)}(\vec{r}) = 3.61312 > 3 \quad (135)$$

RESULTS

VIOLATION: 3.613121265803934

This is vector A:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

[0.]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[0.41681757+0.6275357j ]
 [0.04509476+0.65607052j]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ 0.04107473+0.14695935j]
 [-0.58439897-0.17157489j]
 [ 0.05183167+0.7765753j ]]
```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.29717858-0.34874639j]
 [ 0.21176633-0.82785786j]
 [-0.19426885-0.14875096j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.29597874-0.65933128j]
 [ 0.29611896-0.5314886j ]
 [-0.32483027-0.04469415j]]
```

———— Run time is 4944.514639377594 seconds ————

4.51.3 Qquarts

$$h^{(111)}(\vec{r}) = 3.2949 > 3 \quad (136)$$

———— RESULTS ————

VIOLATION: 3.294924285063765

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
```

```
[0.]  
[0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.50312373+0.71071824j]
 [0.49141929+0.01591142j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.05310847+0.14482226j]
 [0.43851564+0.03481846j]
 [0.62866104+0.62248133j]
 [0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.40342778+0.39470821j]
 [0.48276929+0.65575968j]
 [-0.0299308 +0.10693247j]
 [-0.07357413-0.02491892j]]

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.10360016+0.81739446j]
 [0.12966284+0.34455555j]
 [0.10990261+0.39592285j]
 [-0.10828968-0.07100862j]]

———— Run time is 2623.4600570201874 seconds ————

4.52 Equation 112

4.52.1 Qbits

$$h^{(112)}(\vec{r}) = 3.6157 > 3 \quad (137)$$

———— RESULTS ————

VIOLATION: 3.6157154721796263

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.03153296 - 0.86066411j \\ -0.3364709 - 0.38085469j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.36885794 + 0.14768931j \\ -0.22090839 + 0.8906914j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.00328302 - 0.07438249j \\ -0.83274852 - 0.54862225j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24914893 - 0.67159359j \\ -0.6566425 - 0.23602434j \end{bmatrix}$

Run time is 4827.933088541031 seconds

4.52.2 Qtrits

$$h^{(112)}(\vec{r}) = 3.57345 > 3 \quad (138)$$

RESULTS

VIOLATION: 3.573453163642629

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.17446584+0.77208936j]
 [0.32943581+0.51469578j]
 [0.          +0.j      ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.0776223 -0.32879353j]
 [-0.19119803-0.80185518j]
 [ 0.15566308-0.42674369j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.04998502-0.1660414j ]
 [-0.06003249-0.21288933j]
 [ 0.48189009-0.82993249j]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.59815633-0.38799302j]
 [-0.32513824-0.10113868j]
 [-0.45595398-0.40967363j]]
```

```
———— Run time is 5686.57710981369 seconds ————
```

4.52.3 Qquarts

$$h^{(112)}(\vec{r}) = 3.4772 > 3 \quad (139)$$

```
———— RESULTS ————
```

```
VIOLATION: 3.4772770469229304
```

```
This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
```

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.29133939+0.13188837j]
 [0.83906369+0.44011242j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.16911988+0.07449783j]
 [0.81723949+0.49027691j]
 [0.05134293+0.2344368j ]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.06004475+0.21555956j]
 [  0.31851268+0.36686234j]
 [ -0.50371507-0.08871657j]
 [  0.44127111-0.50751424j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.46560215+0.26832337j]
 [ 0.66287335-0.05676537j]
 [-0.18016762+0.33181958j]
 [-0.07300798-0.34741767j]]
```

Run time is 41033.49860692024 seconds

4.53 Equation 113

4.53.1 Qbits

$$h^{(113)}(\vec{r}) = 3.6297 > 3 \quad (140)$$

RESULTS

VIOLATION: 3.629790652061635

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.32222057+0.89711017j \\ -0.1564178 -0.25865173j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.32176337-0.17460104j \\ -0.91603061+0.16392293j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.21178433+0.64314688j \\ 0.64850989+0.34777063j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.52670922-0.76550885j \\ -0.34606846-0.12965419j \end{bmatrix}$

———— Run time is 1775.6638832092285 seconds ————

———— Run time is 16561.17111134529 seconds ————

4.53.2 Qtrits

$$h^{(113)}(\vec{r}) = 3.6007 > 3 \quad (141)$$

———— RESULTS ————

VIOLATION: 3.600712922620186

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.55023439+0.32554794j \\ 0.18553266+0.74621598j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.34436072-0.35704298j \\ -0.08798705+0.29081213j \\ -0.26500261+0.76902289j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.78322337-0.44738801j \\ -0.33729603-0.05633315j \\ -0.06507358+0.25539873j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.60349863-0.50802044j \\ 0.15870808+0.19768112j \\ -0.05587861+0.55706027j \end{bmatrix}$

———— Run time is 5919.352426290512 seconds ————
———— Run time is 15422.865531206131 seconds ————

4.53.3 Qquarts

$$h^{(113)}(\vec{r}) = 3.31299 > 3 \quad (142)$$

———— RESULTS ————

VIOLATION: 3.312991583046851

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.67173996+0.51789202j]  
 [0.46691166+0.25009355j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.15755495+0.04784917j]  
 [0.40836089+0.20682136j]  
 [0.70215283+0.51993711j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.48781842+0.38097324j]  
 [-0.09497158-0.14287754j]  
 [-0.72695015-0.13042294j]  
 [ 0.16316153-0.12397839j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.00177614-0.80007388j]  
 [ 0.13204388-0.45900961j]  
 [ 0.23267453-0.27754294j]  
 [-0.02136755-0.01136341j]]
```

———— Run time is 23912.39267516136 seconds ————

———— Run time is 28446.94923901558 seconds ————

4.54 Equation 114

4.54.1 Qbits

$$h^{(114)}(\vec{r}) = 3.6189 > 3 \quad (143)$$

————— RESULTS —————

VIOLATION: 3.6189317387839424

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25765863 - 0.87740315j \\ -0.13862709 - 0.3802082j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.52673976 - 0.15421417j \\ 0.80462453 - 0.22658903j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.95507052 - 0.05703834j \\ -0.26437118 + 0.12122213j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.68446434 - 0.31526675j \\ -0.29614606 + 0.58686706j \end{bmatrix}$

————— Run time is 271.8807146549225 seconds —————

4.54.2 Qtrits

$$h^{(114)}(\vec{r}) = 3.614405 > 3 \quad (144)$$

RESULTS

VIOLATION: 3.614405813698229

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.46580426+0.119955j ]
 [0.68889247+0.54227701j]
 [0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[−0.15895347+0.08516622j]
 [−0.29381758−0.36336144j]
 [−0.84062199+0.20609433j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.28134325−0.56010423j]
 [0.58177504−0.11835011j]
 [0.12090241−0.48994172j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.85524896−0.16222935j]
 [−0.23499691+0.11558661j]
 [ 0.41449447+0.04291127j]]
```

———— Run time is 1306.9270191192627 seconds ————

———— Run time is 15543.796696662903 seconds ————

4.54.3 Qquarts

$$h^{(114)}(\vec{r}) = 3.3814 > 3 \quad (145)$$

RESULTS

VIOLATION: 3.3814528290135017

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.47684659+0.62806983j]
 [0.43088231+0.43873233j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.26362946+0.21439679j]
 [0.0114186  +0.11211669j]
 [0.79379116+0.491659j   ]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.73118491-0.26978686j]
 [0.1117621  -0.16037703j]
 [0.5895233  -0.02100614j]
 [0.03032497+0.07398333j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.03888141+0.6951803j ]
 [ 0.05873332-0.24535049j]
 [-0.33138777+0.48749962j]
 [-0.25301432-0.20019025j]]
```

Run time is 876.7971289157867 seconds

———— Run time is 11942.170040845871 seconds ————

4.55 Equation 115

4.55.1 Qbits

$$h^{(115)}(\vec{r}) = 3.645236 > 3 \quad (146)$$

———— RESULTS ————

VIOLATION: 3.64523627233423

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.87898697 - 0.28604633j \\ -0.14513391 - 0.35283927j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.04952305 - 0.08445842j \\ -0.63561509 + 0.76577262j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.5942728 - 0.32447391j \\ -0.47859098 - 0.55902343j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.29332075 + 0.31871022j \\ 0.73083033 + 0.5275166j \end{bmatrix}$

———— Run time is 20.417750120162964 seconds ————

———— Run time is 21602.10091996193 seconds ————

4.55.2 Qtrits

$$h^{(115)}(\vec{r}) = 3.5818 > 3 \quad (147)$$

RESULTS

VIOLATION: 3.58189868361827

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.16591384+0.48092218j]  
 [0.44478295+0.73712589j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.17809688-0.21731109j]  
 [-0.26167632+0.13589208j]  
 [ 0.76143972+0.50430724j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.7770197  -0.27877862j]  
 [-0.53486166+0.05594753j]  
 [ 0.16723994+0.03669533j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.25804584+0.08923062j]  
 [-0.84139699+0.43266506j]  
 [ 0.11474331-0.13090556j]]
```

Run time is 184.7505021095276 seconds

4.55.3 Qquarts

$$h^{(115)}(\vec{r}) = 3.4385 \quad (148)$$

RESULTS

VIOLATION: 3.4385063210663573

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.58273371+0.11693236j]  
 [0.55249919+0.58437393j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.02785478+0.24256988j]  
 [0.43812787+0.38334523j]  
 [0.53910207+0.55753326j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.66781246+0.44573483j]  
 [ 0.43767905+0.35834793j]  
 [ 0.16907748+0.03502933j]  
 [-0.0237233  +0.07066645j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.22461542+0.15214303j]  
 [-0.85954223+0.38008027j]]
```

```
[-0.17788562-0.03476635j]
[ 0.09059152+0.04547234j]]
```

———— Run time is 1365.9284744262695 seconds ————

4.56 Equation 116

4.56.1 Qbits

$$h^{(116)}(\vec{r}) = 3.6167357 > 3 \quad (149)$$

RESULTS

VIOLATION: 3.616735711300799

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.93361573-0.25346008j]
 [ -0.08623569+0.23808203j]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.40759269-0.25022774j]
 [-0.3924663 -0.78563635j]]
```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.75921498-0.16778837j]
 [-0.04822181-0.62698831j]]
```

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.21617381+0.03804036j]
 [0.33397576-0.91666897j]]
```

———— Run time is 198.3054404258728 seconds ————

4.56.2 Qtrits

$$h^{(116)}(\vec{r}) = 3.5056 > 3 \quad (150)$$

———— RESULTS ————

VIOLATION: 3.5056965504737336

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.00089439+0.59357658j \\ 0.46616497+0.65601544j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.04050813+0.47816416j \\ 0.73257564+0.46901889j \\ -0.04380193+0.1056112j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.68348111+0.32243176j \\ -0.39055587+0.38214874j \\ 0.06011912-0.35595713j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.41069636+0.01055686j \\ -0.25113839+0.09487474j \\ 0.45103659-0.74546049j \end{bmatrix}$

Run time is 1516.420475244522 seconds

4.56.3 Qquarts

$$h^{(116)}(\vec{r}) = 3.482 > 3 \quad (151)$$

RESULTS

VIOLATION: 3.48256209933219

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.47514371+0.38992668j]
 [0.71810322+0.32637925j]
 [0.                +0.j      ]
 [0.                +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.29934499+0.3169933j ]
 [0.77229767+0.40814544j]
 [0.17749239+0.12400764j]
 [0.                +0.j      ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.33741644 -0.73256762j]
 [ -0.41833679 -0.21826037j]
 [ -0.02186045 -0.31175491j]
 [  0.14783245 -0.08560449j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```

Qobj data =
[[ -0.02317602 -0.16176936j]
 [ -0.06812321 +0.36013263j]
 [ -0.55870094 -0.53912379j]
 [ -0.19603119 -0.44466598j]]

```

———— Run time is 1422.0422472953796 seconds ————

4.57 Equation 117

4.57.1 Qbits

$$h^{(117)}(\vec{r}) = 3.6028 > 3 \quad (152)$$

———— RESULTS ————

VIOLATION: 3.602893956205871

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.18335823 +0.90646849j]
 [-0.13327948 -0.35627409j]]

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.54959318 -0.47740573j]
 [-0.67223862 -0.13463411j]]

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.33655286 +0.25266107j]
 [0.87979996 +0.22101264j]]

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```
[[0.8489153+0.33098184j]
 [0.384283 -0.14872932j]]
```

———— Run time is 3930.0101685523987 seconds ————

4.57.2 Qtrits

$$h^{(117)}(\vec{r}) = 3.6576 > 3 \quad (153)$$

———— RESULTS ————

VIOLATION: 3.657605903927646

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.45896196+0.44196588j]
 [0.61337754+0.4666777j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.1669557 +0.86678555j]
 [-0.03667464-0.39375318j]
 [0.06881925+0.24430703j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.30557689+0.06524544j]
 [-0.0412858 +0.17055712j]
 [0.82153535-0.44345373j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.40746284-0.74227073j]

```
[-0.2233205 -0.25219791j]
[-0.40786466 -0.05638071j]]
```

———— Run time is 1926.4287250041962 seconds ————

4.57.3 Qquarts

$$h^{(117)}(\vec{r}) = 3.29557 > 3 \quad (154)$$

———— RESULTS ————

VIOLATION: 3.2955795958735

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[0.62667052+0.48921229j]
 [0.06957343+0.60259018j]
 [0.                +0.j          ]
 [0.                +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[0.00312886+0.76434479j]
 [0.52949891+0.12959963j]
 [0.18560897+0.29008861j]
 [0.                +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[ 0.16707974-0.07968284j]
 [ 0.26753677-0.26925422j]
 [ 0.63275188-0.20109636j]
 [-0.5393373  -0.29993637j]]
```

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.47748158+0.70877891j \\ 0.24565788+0.23111094j \\ 0.21499139+0.14975286j \\ 0.04569462-0.29180219j \end{bmatrix}$

Run time is 3579.04070186615 seconds

Run time is 10609.926308393478 seconds

4.58 Equation 118

4.58.1 Qbits

$$h^{(118)}(\vec{r}) = 3.59587 > 3 \quad (155)$$

RESULTS

VIOLATION: 3.595872832078971

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.65260162+0.69808154j \\ -0.12151081+0.2683811j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.9284533-0.0820511j \\ -0.3487089-0.09820484j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.34437344+0.10940262j \\ 0.90774803+0.21314669j \end{bmatrix}$

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.70906518+0.28882087j]
[0.52906108+0.3659282j]]

———— Run time is 3013.7300651073456 seconds ————

4.58.2 Qtrits

$$h^{(118)}(\vec{r}) = 3.651843 > 3 \quad (156)$$

———— RESULTS ————

VIOLATION: 3.6518433615327903

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.42308394+0.40207356j]
[0.65143137+0.48474117j]
[0. +0.j]]

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.68688597-0.40093578j]
[-0.3009136 -0.05946723j]
[-0.31661374+0.41606317j]]

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.08753118-0.35798755j]
[-0.04532576-0.0206793j]
[-0.72873184-0.57502265j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.31090378-0.83195027j \\ 0.12541255+0.26335299j \\ -0.28361145-0.21372654j \end{bmatrix}$

Run time is 3447.78333234787 seconds

4.58.3 Qquarts

$$h^{(118)}(\vec{r}) = 3.39566 > 3 \quad (157)$$

VIOLATION: 3.3956655370777744

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.5530505+0.52154621j \\ 0.62519386+0.17679743j \\ 0.+0.j \\ 0.+0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.34787634+0.83852058j \\ 0.14515124+0.36854888j \\ 0.0308854+0.13421705j \\ 0.+0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.14205856+0.22897275j \\ -0.11217895+0.14529392j \\ -0.54978876+0.55795975j \end{bmatrix}$

$[-0.52322011+0.07968911j]$

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.48263545-0.63714324j \\ 0.51325346+0.17634553j \\ 0.02867542-0.23552724j \\ 0.01052313+0.10088883j \end{bmatrix}$

———— Run time is 1498.6955959796906 seconds ————

4.59 Equation 119

4.59.1 Qbits

$$h^{(119)}(\vec{r}) = 3.637899 > 3 \quad (158)$$

RESULTS

VIOLATION: 3.6378996883587895

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.90778606+0.22210749j \\ 0.32186611-0.15164079j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.58176932-0.51055022j \\ 0.42653699-0.46792001j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.35187501+0.89580893j \end{bmatrix}$

```
[-0.04135378+0.26832856j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.39361566+0.19752891j]
 [0.88499484+0.1511065j ]]
```

———— Run time is 566.673198223114 seconds ————

4.59.2 Qtrits

$$h^{(119)}(\vec{r}) = 3.56306 > 3 \quad (159)$$

———— RESULTS ————

VIOLATION: 3.56306584679335

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.34176179+0.5641365j ]
 [0.44843409+0.60320457j]
 [0.          +0.j      ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.44938748+0.70090725j]
 [ 0.17224431-0.1565574j ]
 [ 0.18182502+0.4685523j ]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.76357762+0.3818714j ]
 [-0.31948582+0.15260804j]
 [-0.13340653+0.35772301j ]]
```

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.04516705+0.37195589j \\ -0.06349924+0.33272947j \\ 0.56710431+0.65058466j \end{bmatrix}$

———— Run time is 1709.4814772605896 seconds ————

4.59.3 Qquarts

$$h^{(119)}(\vec{r}) = 3.301481 > 3 \quad (160)$$

———— RESULTS ————

VIOLATION: 3.301481190080016

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.35020412+0.0431823j \\ 0.35372082+0.86624128j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.80541775+0.24917014j \\ 0.02788047+0.09977753j \\ 0.30881663+0.42792044j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```

Qobj data =
[[-0.03714527+0.61692078j]
 [-0.51467285+0.25993341j]
 [-0.23745163+0.28073874j]
 [-0.07354626-0.3807478j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.12334152+0.03084208j]
 [ 0.05058092-0.29018878j]
 [ 0.0511739 -0.54795364j]
 [ 0.74630839+0.19292354j]]

```

———— Run time is 7965.4942944049835 seconds ————

4.60 Equation 120

4.60.1 Qbits

$$h^{(120)}(\vec{r}) = 3.614792 > 3 \quad (161)$$

RESULTS

VIOLATION: 3.6147924949109775

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.90252795+0.12632416j]
 [-0.16945048+0.37519602j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.44261076-0.84114717j]
 [-0.30619603+0.05302029j]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.67864715+0.31250115j]
 [ 0.00477804+0.66464896j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.21532014-0.43529197j]
 [-0.81235239+0.32286489j]]

```

———— Run time is 441.2388458251953 seconds ————

4.60.2 Qtrits

$$h^{(120)}(\vec{r}) = 3.57690 > 3 \quad (162)$$

———— RESULTS ————

VIOLATION: 3.576908682018985

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.11449777+0.69662362j]
 [0.70199529+0.09385309j]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.74005568+0.42659102j]
 [ 0.06111284-0.32642573j]
 [-0.09609538-0.38834885j]]

```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.90112211-0.15091963j \\ -0.19525233+0.28311871j \\ -0.01609753-0.21601714j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.47960355-0.19373625j \\ -0.17133967+0.18599033j \\ -0.7853315 -0.22748944j \end{bmatrix}$

———— Run time is 1225.7340185642242 seconds ————

4.60.3 Qquarts

$$h^{(120)}(\vec{r}) = 3.4080 > 3 \quad (163)$$

———— RESULTS ————

VIOLATION: 3.408050478755186

This is vector A:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.71923712+0.10117356j \\ 0.38610469+0.56866953j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.6816127 +0.41506755j \\ 0.52726523+0.00134577j \\ 0.27951367+0.08357467j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.3451756 +0.67630685j]
 [  0.59831379+0.09843125j]
 [ -0.06331587+0.19646381j]
 [  0.02519291+0.11204077j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.02537847+0.41105726j]
 [ 0.45719776+0.19221349j]
 [ 0.39510771+0.56375912j]
 [ 0.33233365+0.00565193j]]
```

———— Run time is 1861.7012152671814 seconds ————

4.61 Equation 121

4.61.1 Qbits

$$h^{(121)}(\vec{r}) = 3.60247 > 3 \quad (164)$$

RESULTS

VIOLATION: 3.602472134032008

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 1.]
 [ 0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.86604351-0.33883745j]
 [ 0.34376809+0.13031238j]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```
Qobj data =
[[-0.57934031-0.421208j ]
 [-0.3370095  -0.61104273j]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.06044444-0.11290829j]
 [-0.5773467  -0.80639257j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.39843521+0.21879449j]
 [0.11426315+0.88335852j]]
```

———— Run time is 1289.127099275589 seconds ————

4.61.2 Qtrits

$$h^{(121)}(\vec{r}) = 3.585 > 3 \quad (165)$$

———— RESULTS ————

VIOLATION: 3.5857347281095717

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.11078185+0.60435524j]
 [0.49328614+0.61575232j]
 [0.          +0.j          ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.26855562+0.86714569j]
```

```
[ 0.08911143+0.2265634j ]
[-0.00393835+0.34153901j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.41114558-0.03991665j]
 [-0.10148615-0.00825445j]
 [-0.7969222 -0.42885126j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.03553052+0.41336144j]
 [ 0.42707559+0.80067939j]
 [ 0.05145924+0.04172297j]]
```

———— Run time is 3216.898843050003 seconds ————

4.61.3 Qquarts

$$h^{(121)}(\vec{r}) = 3.26320 > 3 \quad (166)$$

———— RESULTS ————

VIOLATION: 3.2632094632287405

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.68211321+0.33042519j]
 [0.3675264 +0.53894815j]
 [0.          +0.j          ]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```



```

Qobj data =
[[0.55892624+0.467073j  ]
 [0.33432123+0.19796987j]
 [0.47674017+0.30199391j]
 [0.          +0.j      ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 0.14196262-0.1684217j ]
 [-0.04284662-0.32935762j]
 [ 0.78081838-0.44424684j]
 [ 0.16820481+0.07643968j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.12142942+0.22395337j]
 [-0.57363542+0.5330896j ]
 [ 0.10644961+0.48480957j]
 [ 0.2565926  -0.0982144j ]]

```

———— Run time is 864.7379634380341 seconds ————

4.62 Equation 122

4.62.1 Qbits

$$h^{(122)}(\vec{r}) = 3.6295 > 3 \quad (167)$$

———— RESULTS ————

VIOLATION: 3.629512710031693

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[-0.22953696+0.9042015j ]
 [-0.10368316+0.34493801j]]

```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.77923272+0.11723676j \\ -0.51325231-0.34003526j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.37128192+0.24517288j \\ 0.45032047+0.77411334j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.15658933-0.11199148j \\ 0.67949358+0.70797328j \end{bmatrix}$

Run time is 1151.9261701107025 seconds

Run time is 10082.659232616425 seconds

4.62.2 Qtrits

$$h^{(122)}(\vec{r}) = 3.60161 > 3 \quad (168)$$

RESULTS

VIOLATION: 3.6016133760276343

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.44521329+0.1016215j \\ 0.27103537+0.84734764j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.62067948+0.51741864j \\ -0.12671814+0.39825451j \\ -0.41032543-0.06327595j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.16669644+0.18621534j \\ -0.82889778-0.02057282j \\ -0.22572729-0.44619341j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.13077117+0.23340425j \\ -0.26362565-0.06928145j \\ 0.01768933-0.92401842j \end{bmatrix}$

———— Run time is 42039.69888305664 seconds ————

4.62.3 Qquarts

$$h^{(122)}(\vec{r}) = 3.453245 > 3 \quad (169)$$

———— RESULTS ————

VIOLATION: 3.453245470973739

This is vector A:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.29680469+0.44549986j \\ 0.64388451+0.54667137j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.58285187+0.64530222j]
 [0.01659183+0.35989458j]
 [0.00391005+0.3377189j ]
 [0.          +0.j       ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.16937242+0.01272987j]
 [-0.94450531-0.10555046j]
 [-0.20391854-0.12690222j]
 [-0.08997062+0.0462396j ]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.5981009 -0.10606354j]
 [-0.00161172-0.29110814j]
 [-0.43137856-0.59151804j]
 [-0.03222986+0.09622614j]]

```

———— Run time is 1805.6562724113464 seconds ————

4.63 Equation 123

4.63.1 Qbits

$$h^{(123)}(\vec{r}) = 3.60636 > 3 \quad (170)$$

RESULTS

VIOLATION: 3.606363671618139

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $[[0.42838281+0.63428568j]$
 $[0.10570609+0.63481971j]]$

This is vector C:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $[[0.23822795-0.45697232j]$
 $[0.51319188-0.68633653j]]$

This is vector D:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $[[-0.7114808 \quad -0.5631866j]$
 $[\quad 0.09536055+0.40929487j]]$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $[[0.6167628 \quad +0.70631149j]$
 $[0.20754058+0.27866581j]]$

———— Run time is 272.1608512401581 seconds ————
 ———— Run time is 12944.515433073044 seconds ————

4.63.2 Qtrits

$$h^{(123)}(\vec{r}) = 3.6140 > 3 \quad (171)$$

———— RESULTS ————

VIOLATION: 3.614054159495037

This is vector A:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $[[1.]$
 $[0.]$
 $[0.]]$

This is vector B:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =

```
[[0.64681825+0.63670659j]
 [0.31853594+0.27343322j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.00117974-0.26392972j]
 [-0.23556023-0.88727854j]
 [-0.17259553+0.24041354j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.38130991+0.23336368j]
 [-0.36469557+0.17357283j]
 [-0.17218062-0.77933792j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.48676888-0.39772741j]
 [ 0.65379067-0.10462229j]
 [-0.40432454-0.05479563j]]
```

———— Run time is 991.1779429912567 seconds ————

4.63.3 Qquarts

$$h^{(123)}(\vec{r}) = 3.55374 > 3 \quad (172)$$

———— RESULTS ————

VIOLATION: 3.5537486713074022

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```

Qobj data =
[[0.69581948+0.67056704j]
 [0.18361303+0.18017031j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.28090395+0.40705756j]
 [0.75987278+0.33136231j]
 [0.25258859+0.06624572j]
 [0.          +0.j       ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.08132185-0.3438639j ]
 [ 0.3111807  -0.03878013j]
 [-0.15288917-0.43341407j]
 [ 0.17199709+0.73212103j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.43416601+0.68110736j]
 [ 0.27318593+0.29545239j]
 [ 0.24035054+0.22411877j]
 [-0.19170515-0.20229064j]]

```

———— Run time is 746.4414477348328 seconds ————

4.64 Equation 124

4.64.1 Qbits

$$h^{(124)}(\vec{r}) = 3.636531 > 3 \quad (173)$$

———— RESULTS ————

VIOLATION: 3.636531979280249

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```

```
[[1.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.62338105+0.69187532j]  
 [-0.33612238-0.14045057j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.01439248+0.45207528j]  
 [-0.839257 +0.30177556j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.8598236 -0.37796096j]  
 [-0.20071065-0.27850338j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.71234872+0.00424476j]  
 [-0.05925019-0.6993073j]]
```

———— Run time is 3750.1003937721252 seconds ————

4.64.2 Qtrits

$$h^{(124)}(\vec{r}) = 3.6230 > 3 \quad (174)$$

———— RESULTS ————

VIOLATION: 3.6230712862983756

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.72346497+0.48276865j \\ 0.01757018+0.49317761j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.37257644+0.10804587j \\ -0.40804161+0.78824406j \\ 0.24398515+0.04644867j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.70039331+0.25066084j \\ -0.19353618+0.03359198j \\ 0.37810868-0.51484707j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.79261463+0.3243758j \\ -0.09817333+0.17149871j \\ 0.47165096-0.07097855j \end{bmatrix}$

Run time is 3621.7790942192078 seconds

Run time is 10821.747822999954 seconds

4.64.3 Qquarts

$$h^{(124)}(\vec{r}) = 3.63671734 > 3 \quad (175)$$

RESULTS

VIOLATION: 3.6367173430937783

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

```
[0.]  
[0.]]
```

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.52309194+0.53474459j]
 [0.4320685 +0.50372596j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.15934009+0.13919252j]
 [0.64012688+0.67464541j]
 [0.14709025+0.26209118j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.24545755+0.50812204j]
 [-0.12371004+0.40392925j]
 [0.56867038-0.31362385j]
 [0.20331059-0.20004613j]]

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.5883165 +0.6954233j]
 [-0.06122438+0.151358j]
 [-0.30124543+0.05595692j]
 [-0.22006778+0.03609207j]]

———— Run time is 1417.4480714797974 seconds ————
———— Run time is 9068.181784152985 seconds ————

4.65 Equation 125

4.65.1 Qbits

$$h^{(125)}(\vec{r}) = 3.6052303 > 3 \quad (176)$$

————RESULTS————

VIOLATION: 3.605230355824913

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.26027465 - 0.68326791j \\ 0.67763348 + 0.0788348j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.29275851 - 0.45943894j \\ 0.50655053 - 0.66829251j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.26822837 + 0.89641383j \\ -0.35060798 - 0.03962103j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.75141419 - 0.45615809j \\ -0.0725894 + 0.47119772j \end{bmatrix}$

———— Run time is 19831.219272613525 seconds ————

4.65.2 Qtrits

$$h^{(125)}(\vec{r}) = 3.562746 > 3 \quad (177)$$

———— RESULTS ————

VIOLATION: 3.5627464246941534

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.85503855+0.4061557j ]
 [0.29934674+0.11974205j]
 [0.          +0.j       ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.47962885-0.02544078j]
 [0.71968947+0.1374561j ]
 [0.11878752-0.46728079j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.28727466-0.75544962j]
 [ 0.57062346-0.03868513j]
 [-0.12690059-0.05964655j]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.22864038-0.48392191j]
 [ 0.65590135+0.32002129j]
 [-0.32994335+0.26844058j]]
```

———— Run time is 2020.0452704429626 seconds ————

4.65.3 Qquarts

$$h^{(125)}(\vec{r}) = 3.469320 > 3 \quad (178)$$

———— RESULTS ————

VIOLATION: 3.4693203464581766

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.33114478+0.89806467j]
 [0.25729981+0.13273953j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.10764911+0.27830711j]
 [0.51135421+0.57375786j]
 [0.41732695+0.38224838j]
 [0.          +0.j       ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.57794991+0.2947276j ]
 [0.33790142-0.30095192j]
 [0.41852485-0.29555536j]
 [0.29158319+0.16377831j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.29463914+0.32381411j]
 [-0.1021561  -0.25663185j]
 [ 0.63558288+0.13747667j]
 [ 0.09590141+0.54769875j]]
```

———— Run time is 752.4206650257111 seconds ————

4.66 Equation 126

4.66.1 Qbits

$$h^{(126)}(\vec{r}) = 3.58709 > 3 \quad (179)$$

RESULTS

VIOLATION: 3.5870916588494315

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.93781897 - 0.0624846j \\ 0.33526613 + 0.06471387j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.37142008 + 0.10972216j \\ 0.78827244 + 0.47815764j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.66817666 - 0.08469913j \\ 0.7372918 - 0.05260054j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.89869221 + 0.28507426j \\ -0.25743758 - 0.21168577j \end{bmatrix}$

Run time is 12155.836116075516 seconds

4.66.2 Qtrits

$$h^{(126)}(\vec{r}) = 3.579741 > 3 \quad (180)$$

RESULTS

VIOLATION: 3.579741750193024

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.83088148+0.28551677j]
 [0.21098826+0.42848582j]
 [0.          +0.j      ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.22968534-0.32042858j]
 [-0.17214964-0.45471596j]
 [ 0.27489992-0.72979319j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.75320209+0.53158476j]
 [-0.04449627+0.22599605j]
 [-0.22573138-0.21469855j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.63429605-0.28835642j]
 [ 0.11358391-0.63831291j]
 [-0.12399635+0.28071217j]]

```

```

Run time is 1737.945878982544 seconds

```

4.66.3 Qquarts

$$h^{(126)}(\vec{r}) = 3.4508 > 3 \quad (181)$$

RESULTS

VIOLATION: 3.450898033088067

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.79661181+0.02995832j]
 [0.4030707 +0.44949542j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.3661625 +0.09253006j]
 [0.28097811+0.60904379j]
 [0.16144562+0.61758845j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.76008408+0.25391947j]
 [ -0.32798516-0.3200737j ]
 [ -0.28142854-0.21182742j]
 [ -0.03971655+0.148746j  ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.50469324+0.33712291j]
 [ 0.02243794+0.4070832j ]
 [ 0.14923726-0.5504242j ]
 [-0.36752145+0.07142906j]]
```

———— Run time is 392.42168164253235 seconds ————

4.67 Equation 127

4.67.1 Qbits

$$h^{(127)}(\vec{r}) = 3.6016411 > 3 \quad (182)$$

RESULTS

VIOLATION: 3.60164117385683

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.48603065 - 0.67098954j \\ 0.52259636 - 0.20109771j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.20215481 + 0.89960442j \\ 0.02916812 - 0.38599811j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.25719133 + 0.43600815j \\ -0.7020304 + 0.50090202j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.07541403 + 0.96956102j \\ -0.14298942 + 0.18389722j \end{bmatrix}$

Run time is 2701.8773839473724 seconds

4.67.2 Qtrits

$$h^{(127)}(\vec{r}) = 3.58144 > 3 \quad (183)$$

RESULTS

VIOLATION: 3.5814496054862803

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.01844063+0.84694582j]
 [0.3268035 +0.41897756j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.59001049-0.15032765j]
 [ 0.08056525+0.25638831j]
 [-0.42110744-0.616224j  ]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.15248499+0.32623601j]
 [ 0.20447428+0.90078826j]
 [ 0.13001246+0.01363541j ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.82803325+0.12092474j]
 [ 0.36083167-0.1383169j ]
 [-0.20549545-0.3289053j  ]]
```

Run time is 1083.8977813720703 seconds

4.67.3 Qquarts

$$h^{(127)}(\vec{r}) = 3.3725 > 3 \quad (184)$$

RESULTS

VIOLATION: 3.3725991227618284

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.87605426+0.41929639j]  
 [0.00753141+0.23803939j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.01048334+0.46706043j]  
 [0.65299222+0.45101142j]  
 [0.24731852+0.30127737j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.08205433+0.25560165j]  
 [  0.24515406-0.05906162j]  
 [-0.20399917+0.03379687j]  
 [  0.60811784+0.67214649j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.56026642-0.34965156j]  
 [-0.53571208+0.21295315j]  
 [-0.13664106+0.04474782j]  
 [-0.44483073-0.11384784j]]
```

———— Run time is 32455.316679239273 seconds ————

4.68 Equation 128

4.68.1 Qbits

$$h^{(128)}(\vec{r}) = 3.6045 > 3 \quad (185)$$

RESULTS

VIOLATION: 3.604533650302097

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.61995875 - 0.60900426j \\ -0.2311196 + 0.43743422j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.54104051 + 0.79746129j \\ -0.26541584 + 0.02975055j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.29259252 + 0.27395971j \\ 0.61223113 - 0.68154878j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.46665287 - 0.52937956j \\ -0.61031034 + 0.35988007j \end{bmatrix}$

———— Run time is 2695.597677707672 seconds ————

4.68.2 Qtrits

$$h^{(128)}(\vec{r}) = 3.567108 > 3 \quad (186)$$

RESULTS

VIOLATION: 3.567108697809585

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.74056806+0.36965246j \\ 0.19886003+0.52475775j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.4143189 -0.54730405j \\ 0.17005041-0.41076154j \\ -0.06726288-0.57151697j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.2799976 -0.26074436j \\ 0.24958487-0.75011457j \\ 0.0639653 +0.47387518j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.7167699 -0.47211522j \\ 0.14214932-0.14700133j \\ 0.45769803-0.10974892j \end{bmatrix}$

Run time is 3017.3084881305695 seconds

4.68.3 Qquarts

$$h^{(128)}(\vec{r}) = 3.42074 > 3 \quad (187)$$

RESULTS

VIOLATION: 3.4207465554879066

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.84147562+0.50120698j]  
 [0.17945838+0.09222276j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.6861706 +0.20016897j]  
 [0.53472487+0.32340421j]  
 [0.15102781+0.27526701j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.11197156 -0.10142857j]  
 [-0.2229429  -0.26220545j]  
 [ 0.07094092+0.67600139j]  
 [-0.57066916+0.26654382j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.08940818+0.90047409j]
```

```

[-0.10609664-0.29700158j]
[ 0.19669817+0.06031792j]
[ 0.13493832+0.14542829j]]

```

———— Run time is 2557.9156188964844 seconds ————

4.69 Equation 129

4.69.1 Qbits

$$h^{(129)}(\vec{r}) = 3.5382 > 3 \quad (188)$$

RESULTS

VIOLATION: 3.5382190215387546

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.73376459-0.089145j \\ 0.67023161+0.06657535j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.44048422+0.77889094j \\ 0.29708725-0.33322924j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.69729071-0.52915553j \\ 0.41926318-0.2408287j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.56969519+0.00975636j \end{bmatrix}$

[0.82146584+0.02336819j]]

———— Run time is 3563.1589572429657 seconds ————

4.69.2 Qtrits

$$h^{(129)}(\vec{r}) = 3.6256443 > 3 \quad (189)$$

———— RESULTS ————

VIOLATION: 3.6256443223885064

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.0576266 +0.80436885j]
[0.12340092+0.57830972j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.67262109-0.22760529j]
[-0.52675207+0.19407234j]
[-0.12016647+0.40768236j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.41677984+0.73276013j]
[-0.14337259+0.0238274j]
[0.01698103-0.51763439j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.1195262 -0.23806082j]


```
[ 0.49761003-0.25347839j]
[-0.36282925+0.6967987j ]]
```

———— Run time is 4327.657613277435 seconds ————

4.69.3 Qquarts

$$h^{(129)}(\vec{r}) = 3.344 > 3 \quad (190)$$

———— RESULTS ————

VIOLATION: 3.344807184089237

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.78915522+0.61316556j]
[0.03523716+0.00451527j]
[0. +0.j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.17089721+0.34774927j]
[0.11965832+0.67584339j]
[0.3115944 +0.53074582j]
[0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.5484719 -0.07743876j]
[0.57718911-0.07943783j]
[0.37261544-0.06325949j]
[0.03314702-0.45801902j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.28869644-0.16062412j \\ -0.49401114+0.10041301j \\ -0.01964815-0.06155912j \\ 0.22968705+0.76144124j \end{bmatrix}$

Run time is 3406.372765302658 seconds

4.70 Equation 130

4.70.1 Qbits

$$h^{(130)}(\vec{r}) = 3.61010 > 3 \quad (191)$$

RESULTS

VIOLATION: 3.610100590004833

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.93796178-0.16772617j \\ 0.23077132-0.19707927j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.84756161+0.03754827j \\ 0.51049937-0.14007082j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33663031+0.77770354j \\ -0.01071561+0.53079413j \end{bmatrix}$

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.5616419 -0.18527528j]
[-0.80636604+0.00229235j]]

———— Run time is 11823.659716844559 seconds ————

4.70.2 Qtrits

$$h^{(130)}(\vec{r}) = 3.60160 > 3 \quad (192)$$

———— RESULTS ————

VIOLATION: 3.601604498872941

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.63672361+0.61721012j]
[0.46210557+0.00965196j]
[0. +0.j]]

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.72609331+0.40445754j]
[-0.00572431+0.20465747j]
[0.45890132-0.23810659j]]

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.64066634+0.32092996j]
[0.44246411-0.3607293j]
[-0.24965249+0.31356676j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.05885244+0.44868033j \\ 0.66074748+0.45654254j \\ -0.31439855-0.2266221j \end{bmatrix}$

Run time is 1762.8586950302124 seconds

4.70.3 Qquarts

$$h^{(130)}(\vec{r}) = 3.4982 > 3 \quad (193)$$

RESULTS

VIOLATION: 3.4982332145549244

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.55805111+0.59808214j \\ 0.45156764+0.3563192j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.35722609+0.50844957j \\ 0.47986392+0.25303295j \\ 0.02193614+0.56488256j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52329867+0.61581432j \end{bmatrix}$

```

[−0.06838775+0.38984777j]
[ 0.26704738−0.34489554j]
[ 0.0018795 −0.00151238j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.23416803+0.22019497j]
 [ 0.32466494+0.64497313j]
 [ 0.07982257−0.47638171j]
 [−0.15922612+0.34149335j]]

```

———— Run time is 45327.31885552406 seconds ————

4.71 Equation 131

4.71.1 Qbits

$$h^{(131)}(\vec{r}) = 3.60520 > 3 \quad (194)$$

RESULTS

VIOLATION: 3.6052072016930943

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

This is vector B:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[−0.72913214−0.03536074j]
 [ 0.61311329+0.30200667j]]

```

This is vector C:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.88579525−0.19824094j]
 [−0.40965754−0.09081847j]]

```

This is vector D:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

```

Qobj data =
[[-0.251425-0.37647236j]
 [-0.108167+0.88507284j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.47790786+0.80009561j]
 [-0.29772319+0.2069106j]]

```

———— Run time is 4559.138509988785 seconds ————

4.71.2 Qtrits

$$h^{(131)}(\vec{r}) = 3.65878 > 3 \quad (195)$$

———— RESULTS ————

VIOLATION: 3.65878793743314

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.70833431+0.57901838j]
 [0.05793438+0.39955454j]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.56346572-0.47582156j]
 [ 0.30802705-0.15220912j]
 [-0.57954524+0.04668248j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =

```

```
[[ -0.24645947+0.05129046j ]
 [ -0.37519587-0.59460451j ]
 [  0.55905055+0.36022637j ]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.34772088+0.52956842j ]
 [  0.49117787+0.05706654j ]
 [  0.48584153-0.34364691j ]]
```

———— Run time is 5932.8329429626465 seconds ————

4.71.3 Qquarts

$$h^{(131)}(\vec{r}) = 3.47800 > 3 \quad (196)$$

———— RESULTS ————

VIOLATION: 3.4780063067137017

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 1.]
 [ 0.]
 [ 0.]
 [ 0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.00218834+0.87233058j ]
 [ 0.16408606+0.46055438j ]
 [ 0.          +0.j          ]
 [ 0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.65369144+0.59562835j ]
 [ 0.24415901+0.10356417j ]
 [ 0.30481973+0.23379508j ]
 [ 0.          +0.j          ]]
```

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.08610942-0.11843114j \\ 0.58534561-0.67334819j \\ 0.31013225-0.24773461j \\ -0.1273644-0.09357255j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.37211932+0.33355679j \\ -0.11162469-0.21739154j \\ 0.69036249+0.41037874j \\ 0.08133608+0.19728479j \end{bmatrix}$

———— Run time is 1063.7698287963867 seconds ————

4.72 Equation 132

4.72.1 Qbits

$$h^{(132)}(\vec{r}) = 3.61057 > 3 \quad (197)$$

———— RESULTS ————

VIOLATION: 3.610578450533046

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.66504744+0.65481283j \\ 0.22604044+0.27899425j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.43817933-0.48317137j \\ -0.32542485-0.68457503j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.09255101-0.44811078j \\ -0.88909274+0.01204751j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.92819749-0.23248266j \\ -0.06842442+0.28234612j \end{bmatrix}$

———— Run time is 3185.0053453445435 seconds ————

4.72.2 Qtrits

$$h^{(132)}(\vec{r}) = 3.58247 > 3 \quad (198)$$

———— RESULTS ————

VIOLATION: 3.5824709932793715

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.64806547+0.6744283j \\ 0.34459443+0.08007674j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.91542782+0.04185349j \\ -0.1055172 -0.19539834j \\ -0.16697199+0.28817729j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.40301388-0.12450858j \\ -0.10545388-0.83880751j \\ 0.04769021+0.32416742j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.326962 & -0.68273665j \\ 0.20980528 & -0.28578084j \\ -0.01450568 & -0.54869587j \end{bmatrix}$

———— Run time is 3013.5515744686127 seconds ————

4.72.3 Qquarts

$$h^{(132)}(\vec{r}) = 3.3292 > 3 \quad (199)$$

———— RESULTS ————

VIOLATION: 3.329256602224622

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.60208364+0.50968733j \\ 0.01326146+0.61444142j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.83105463+0.04747319j \\ 0.46622749+0.28937228j \\ 0.07658505+0.01117278j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.31701211+0.26848142j ]
 [ -0.79531636-0.0955951j  ]
 [  0.1251521  -0.14987071j ]
 [  0.3758329   +0.07987407j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.38256599-0.09926048j ]
  [-0.30880941+0.29628824j ]
  [-0.58950521+0.05129019j ]
  [-0.08329752+0.55095834j ]]
```

———— Run time is 2916.2255113124847 seconds ————

4.73 Equation 133

4.73.1 Qbits

$$h^{(133)}(\vec{r}) = 3.6219 > 3 \quad (200)$$

RESULTS

VIOLATION: 3.621927053460213

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.68636191-0.08036387j ]
 [ -0.60982877-0.38801784j ]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```
Qobj data =
[[ -0.80332454+0.50056075j ]
 [ -0.30324534+0.11023102j ]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.55144279-0.76894131j ]
 [ -0.30299191+0.11329608j ]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.3436703 -0.18983923j]
 [0.89274217-0.22105024j]]
```

———— Run time is 6119.384585618973 seconds ————

4.73.2 Qtrits

$$h^{(133)}(\vec{r}) = 3.5869 > 3 \quad (201)$$

———— RESULTS ————

VIOLATION: 3.586935087999559

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.7856617 +0.40575667j]
 [0.43985127+0.15693336j]
 [0.          +0.j          ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.32687481-0.8325885j ]
 [ -0.10236537+0.12556213j ]]
```

```
[ 0.411078 -0.06869941j ]]
```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ 0.75298547+0.19144757j]
 [-0.50388897+0.07394566j]
 [-0.23349292+0.2871754j ]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.37709486-0.18705344j]
 [-0.39284786+0.16552998j]
 [ 0.36485779-0.71271288j ]]
```

———— Run time is 3325.3600385189056 seconds ————

4.73.3 Qquarts

$$h^{(133)}(\vec{r}) = 3.52718 > 3 \quad (202)$$

———— RESULTS ————

VIOLATION: 3.527183817366275

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.6168497 +0.77381182j]
 [0.04688915+0.13606295j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[0.42851114+0.39093173j]
 [0.55021119+0.35095167j]
 [0.43559532+0.21887866j]
 [0.          +0.j          ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[0.06769715+0.08145644j]
 [0.05013167+0.86963833j]
 [0.40405158+0.16955606j]
 [0.006417   +0.19480714j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.30827951-0.15405911j]
 [-0.45698948+0.26145522j]
 [-0.68480362-0.31406924j]
 [ 0.18690145-0.03877725j]]

```

———— Run time is 1700.7624275684357 seconds ————

4.74 Equation 134

4.74.1 Qbits

$$h^{(134)}(\vec{r}) = 3.588411 > 3 \quad (203)$$

———— RESULTS ————

VIOLATION: 3.588411710556294

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[-0.7178752 -0.57070983j]
 [ 0.38658863+0.09744088j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.24266429-0.76454824j]
 [ 0.50689409+0.31565551j]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.45566579+0.73369255j]
 [ 0.17758711+0.4717274j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.00796849+0.52250349j]
 [-0.67914381-0.51545154j]]

```

```

———— Run time is 808.256829738617 seconds ————

```

4.74.2 Qtrits

$$h^{(134)}(\vec{r}) = 3.63347 > 3 \quad (204)$$

RESULTS

```

VIOLATION: 3.633476042714781

```

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.67729007+0.30832558j]
 [0.46522983+0.47934821j]
 [0.          +0.j          ]]

```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.50727603 - 0.77215294j \\ -0.10131899 - 0.11789476j \\ -0.34935312 + 0.01544495j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.42521638 + 0.29259074j \\ 0.23753776 + 0.62341727j \\ -0.498348 + 0.20039382j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07911084 - 0.07541053j \\ 0.77290975 + 0.0838007j \\ -0.12531341 - 0.60657996j \end{bmatrix}$

———— Run time is 6022.5592296123505 seconds ————

4.74.3 Qquarts

$$h^{(134)}(\vec{r}) = 3.5021 > 3 \quad (205)$$

———— RESULTS ————

VIOLATION: 3.5021165178194105

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.54270885 + 0.5337922j \\ 0.59242225 + 0.26375912j \\ 0. + 0.j \\ 0. + 0.j \end{bmatrix}$

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.21493028+0.78970267j]
 [0.38257553+0.09631015j]
 [0.22293      +0.3533231j ]
 [0.          +0.j          ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.51187122+0.55294278j]
 [-0.04169079+0.2838064j ]
 [-0.34538573-0.34718816j]
 [-0.03755112-0.32972251j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.35336819-0.20655501j]
 [0.42056171-0.70001557j]
 [0.27950349-0.26583887j]
 [0.10291423-0.07866482j]]

```

———— Run time is 422.4134759902954 seconds ————

4.75 Equation 135

4.75.1 Qbits

$$h^{(135)}(\vec{r}) = 3.57285 > 3 \quad (206)$$

———— RESULTS ————

VIOLATION: 3.5728521890727087

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

```

Qobj data =
[[0.70410345+0.5388537j ]
 [0.43038122-0.16925433j ]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.69341474+0.55213577j]
 [-0.45594934-0.08020149j]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.54844775+0.48466721j]
 [-0.14526404-0.66573352j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.29084978-0.70064397j]
 [-0.28375603-0.586504j  ]]

```

———— Run time is 599.337385892868 seconds ————

4.75.2 Qtrits

$$h^{(135)}(\vec{r}) = 3.6519 > 3 \quad (207)$$

———— RESULTS ————

VIOLATION: 3.651903505165317

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.60542046+0.620337j ]
 [0.48085487+0.1320101j]

```

```
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.63105733-0.4989275j ]
 [ 0.33197674-0.17063579j]
 [-0.44703143-0.11694342j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.56019698+0.22904177j]
 [ 0.15205993-0.46007042j]
 [ 0.5756726  +0.25987162j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.83855949-0.23533242j]
 [-0.21952819-0.14208026j]
 [ 0.3013519  +0.28678256j]]
```

———— Run time is 12.806170463562012 seconds ————

———— Run time is 44173.14821386337 seconds ————

4.75.3 Qquarts

$$h^{(135)}(\vec{r}) = 3.49016 > 3 \quad (208)$$

———— RESULTS ————

VIOLATION: 3.4901653321776713

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
```

```
[[0.12160408+0.90797381j]
 [0.40048891+0.02011594j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.45063404+0.68819772j]
 [0.30038344+0.1083959j ]
 [0.33161442+0.33371373j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.1564195  -0.58274764j]
 [  0.46993116 -0.0240319j ]
 [  0.02306888 -0.59983408j]
 [  0.12697481 +0.19511434j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.51085786+0.59281519j]
 [ 0.19194764+0.08043962j]
 [-0.3642897  -0.40160592j]
 [ 0.21432638-0.06595367j]]
```

———— Run time is 1824.4683561325073 seconds ————

4.76 Equation 136

4.76.1 Qbits

$$h^{(136)}(\vec{r}) = 3.63903 > 3 \quad (209)$$

———— RESULTS ————

VIOLATION: 3.639032026983653

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
```

[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.5719627 -0.78208596j]
 [-0.23241054-0.08476769j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.66134749+0.67147247j]
 [-0.31789104-0.10339006j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.51688082-0.56069307j]
 [0.16610137-0.62519424j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.66206008+0.23266877j]
 [-0.70575912+0.09718927j]]

———— Run time is 2647.6067504882812 seconds ————

4.76.2 Qtrits

$$h^{(136)}(\vec{r}) = 3.67465 > 3 \quad (210)$$

———— RESULTS ————

VIOLATION: 3.6746537281383804

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.53433209+0.55617796j \\ 0.34628881+0.53407804j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.68364533+0.38392231j \\ -0.50150558+0.34129982j \\ -0.0446191 -0.12348457j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.60569292-0.20190083j \\ 0.28179984+0.04047684j \\ -0.16140884+0.69661309j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.03519031+0.792347j \\ 0.23671214-0.28189729j \\ -0.48385794-0.03647798j \end{bmatrix}$

———— Run time is 9262.012032985687 seconds ————

4.76.3 Qquarts

$$h^{(136)}(\vec{r}) = 3.479761 > 3 \quad (211)$$

———— RESULTS ————

VIOLATION: 3.4797614428208816

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.76041927+0.50704009j] \\ [0.40289028+0.04850052j] \\ [0. +0.j] \\ [0. +0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.66483986+0.29828119j] \\ [0.55046335+0.35232118j] \\ [0.18662596+0.08394601j] \\ [0. +0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.7517898 +0.20709486j] \\ [0.36361303-0.10982417j] \\ [0.37688647-0.12042722j] \\ [0.30116481-0.02004148j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.28612757-0.54438896j] \\ [0.01485463+0.27682057j] \\ [-0.05266225-0.67189281j] \\ [0.22233563-0.20316246j] \end{bmatrix}$

———— Run time is 843.0802795886993 seconds ————

4.77 Equation 137

4.77.1 Qbits

$$h^{(137)}(\vec{r}) = 3.61546 > 3 \quad (212)$$

———— RESULTS ————

VIOLATION: 3.615464020832582

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.93087062-0.01449486j \\ 0.17362438-0.32112983j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.40867399+0.60728989j \\ 0.52188338+0.43797523j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.31540339+0.88316499j \\ 0.34557511+0.03343874j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.58765112-0.35488563j \\ 0.4454379 +0.57472379j \end{bmatrix}$

———— Run time is 5862.729749202728 seconds ————

4.77.2 Qtrits

$$h^{(137)}(\vec{r}) = 3.62487 > 3 \quad (213)$$

———— RESULTS ————

VIOLATION: 3.6248731537757832

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.81331369+0.045998j]
 [0.50610444+0.28330782j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.46388885+0.72044412j]
 [-0.08896651-0.38371622j]
 [-0.15278782-0.29541514j]]

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[-0.51144348-0.78001998j]
 [0.21438842-0.14998878j]
 [0.00877547+0.24790797j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.56863581-0.03848615j]
 [0.42602256-0.16314926j]
 [0.68211422+0.04218328j]]

———— Run time is 656.1951930522919 seconds ————

———— Run time is 9619.76476931572 seconds ————

4.77.3 Qquarts

$$h^{(137)}(\vec{r}) = 3.29495 > 3 \quad (214)$$

VIOLATION: 3.294957850538725

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.95522288+0.11142636j]  
 [0.07581055+0.26341254j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.19481397+0.20170343j]  
 [0.42297299+0.07262233j]  
 [0.85770486+0.03905724j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.20172312+0.69236207j]  
 [ -0.22745302+0.1713908j ]  
 [  0.22822887+0.54835308j]  
 [  0.211533   -0.0361544j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.42850326+0.73864497j]  
 [  0.29979157-0.06416051j]  
 [ -0.19333901-0.27564998j]  
 [ -0.16441064-0.1907964j ]]
```

———— Run time is 10089.401494264603 seconds ————

4.78 Equation 138

4.78.1 Qbits

$$h^{(138)}(\vec{r}) = 3.63710 > 3 \quad (215)$$

RESULTS

VIOLATION: 3.6371092703133843

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.37719107+0.8835591j \\ -0.24885592-0.12296727j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.49436604+0.57024071j \\ 0.21150722-0.62104142j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.8037754 -0.43809609j \\ -0.40164623-0.02640497j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.24568856+0.66591902j \\ 0.52009228+0.47507159j \end{bmatrix}$

Run time is 9548.96484875679 seconds

4.78.2 Qtrits

$$h^{(138)}(\vec{r}) = 3.488 > 3 \quad (216)$$

RESULTS

VIOLATION: 3.4887388758945472

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.79088942+0.00610765j \\ 0.52371446+0.31651189j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.07323671-0.41256392j \\ -0.31488766-0.11881049j \\ 0.82807585-0.15952309j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.45737761+0.70111767j \\ -0.52723992+0.02151039j \\ 0.04807006+0.13595724j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.68704862-0.44473379j \\ 0.42979623+0.36823225j \\ -0.04856579+0.08658887j \end{bmatrix}$

———— Run time is 1877.4367973804474 seconds ————

4.78.3 Qquarts

$$h^{(138)}(\vec{r}) = 3.46592 > 3 \quad (217)$$

———— RESULTS ————

VIOLATION: 3.4659280658650764

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.15912454+0.51500435j]  
 [0.84219726+0.01239636j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.6363615 +0.24355499j]  
 [0.10111817+0.1740798j ]  
 [0.54999433+0.43897903j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.52539339-0.26151986j]  
 [-0.42980954+0.66242965j]  
 [ 0.08077666+0.02117883j]  
 [ 0.14709162+0.05839954j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.4511263 -0.77023221j]  
 [ 0.23397722+0.2323507j ]  
 [-0.22260217+0.15500327j]  
 [ 0.14074428+0.03329458j]]
```

———— Run time is 352.24082946777344 seconds ————

———— Run time is 13788.326678037643 seconds ————

4.79 Equation 139

4.79.1 Qbits

$$h^{(139)}(\vec{r}) = 3.616112 > 3 \quad (218)$$

RESULTS

VIOLATION: 3.616112995843466

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.9309835 + 0.09335496j \\ 0.33704515 + 0.10466683j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.40584409 + 0.64151056j \\ 0.61134896 - 0.22362297j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.62432171 + 0.40753168j \\ -0.63462937 - 0.20343525j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.83877417 - 0.37643383j \\ -0.10171897 + 0.38001148j \end{bmatrix}$

Run time is 44805.260076999664 seconds

4.79.2 Qtrits

$$h^{(139)}(\vec{r}) = 3.631689 > 3 \quad (219)$$

RESULTS

VIOLATION: 3.6316896200104085

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.05574352+0.76576574j]  
 [0.0942914 +0.63372282j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.17450548+0.78963595j]  
 [  0.17669385-0.37540445j]  
 [-0.4058879  -0.09554419j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[  0.54935188-0.52045597j]  
 [  0.02007354-0.0437577j]  
 [-0.17442056-0.62817026j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[  0.8578597  +0.00386119j]  
 [  0.35874276-0.07244609j]  
 [-0.23334997+0.27507237j]]
```

Run time is 2697.2415914535522 seconds

4.79.3 Qquarts

$$h^{(139)}(\vec{r}) = 3.1070805 > 3 \quad (220)$$

RESULTS

VIOLATION: 3.1070805572276092

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.72908877+0.64649803j]
 [0.06201432+0.21592612j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.23321708+0.07509942j]
 [0.22314815+0.73099785j]
 [0.47710068+0.35803892j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.54418989-0.54445157j]
 [-0.50731746-0.03477107j]
 [ 0.33283772-0.11683942j]
 [-0.04906003+0.14835947j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.90111955+0.00926516j]
 [-0.33255898-0.16434956j]
 [ 0.14854483-0.11927982j]
 [ 0.11828594+0.00257759j]]
```

Run time is 1282.9290964603424 seconds

4.80 Equation 140

4.80.1 Qbits

$$h^{(140)}(\vec{r}) = 3.609126 > 3 \quad (221)$$

————— RESULTS —————

VIOLATION: 3.6091266525733317

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.36771411+0.8936766j \\ -0.20479641+0.15552138j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.67613986+0.34767049j \\ 0.42510032+0.49117189j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.12821155-0.62122822j \\ -0.45820776+0.62264192j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.79596191+0.49858824j \\ -0.15172072-0.30795329j \end{bmatrix}$

————— Run time is 4692.907194852829 seconds —————

4.80.2 Qtrits

$$h^{(140)}(\vec{r}) = 3.64364 > 3 \quad (222)$$

RESULTS

VIOLATION: 3.6436477254824675

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.43291888+0.77708897j]  
 [0.35629035+0.28595659j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.1197882  -0.76471874j]  
 [  0.28431508+0.11036049j]  
 [-0.55032043+0.07063256j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.05183384+0.60291718j]  
 [ 0.03077005-0.5167527j]  
 [-0.57137704-0.19837403j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.73368845-0.28794541j]  
 [0.15139628-0.37600754j]  
 [0.24182215+0.3949788j  ]]
```

Run time is 586.7540311813354 seconds

4.80.3 Qquarts

$$h^{(140)}(\vec{r}) = 3.36658 > 3 \quad (223)$$

RESULTS

VIOLATION: 3.3665887954891227

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.81901617+0.5004046j ]
 [0.09927655+0.26258697j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.49172206+0.10738656j]
 [0.4128302  +0.44177232j]
 [0.61530382+0.04987181j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.31190579-0.60276557j]
 [-0.51269655+0.50999933j]
 [ 0.00715034-0.03756872j]
 [-0.03343967-0.11768869j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.93955444+0.18930211j]
 [ 0.00365732-0.20079615j]
 [-0.13655932+0.14772034j]
 [ 0.02448372+0.00070553j]]
```

———— Run time is 1231.016087770462 seconds ————

4.81 Equation 141

4.81.1 Qbits

$$h^{(141)}(\vec{r}) = 3.608259 > 3 \quad (224)$$

RESULTS

VIOLATION: 3.6082597677222052

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.13292828 - 0.76271196j \\ 0.13522135 + 0.61831685j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.51656109 - 0.11733321j \\ 0.84605276 - 0.0599357j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.01558573 - 0.0162903j \\ -0.97821886 - 0.20634819j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.50341715 + 0.75506362j \\ 0.17766171 - 0.38063948j \end{bmatrix}$

———— Run time is 2498.8156130313873 seconds ————

4.81.2 Qtrits

$$h^{(141)}(\vec{r}) = 3.59168 > 3 \quad (225)$$

RESULTS

VIOLATION: 3.5916837477505936

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.4125518 +0.63916528j]
 [0.22250702+0.60972074j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.16184071-0.20917488j]
 [ 0.39290355-0.77603746j]
 [-0.31935263+0.26732007j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.22051195-0.20993292j]
 [0.55214596-0.41765766j]
 [0.65122576+0.0624865j  ]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.37809593+0.07158596j]
 [-0.43910801+0.5885017j ]
 [ 0.55756363-0.0434928j  ]]
```

Run time is 4406.602963685989 seconds

4.81.3 Qquarts

$$h^{(141)}(\vec{r}) = 3.469418 > 3 \quad (226)$$

RESULTS

VIOLATION: 3.4694184207194256

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.8098119 +0.12965623j]  
 [0.54070873+0.18715773j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.20923124+0.18614992j]  
 [0.68550221+0.44636656j]  
 [0.16411763+0.47484684j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.0560692 -0.12118601j]  
 [ 0.74248947-0.4157099j ]  
 [-0.49131896-0.08427281j]  
 [-0.09711193+0.01174343j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.25099646+0.57177474j ]]
```

```
[ 0.34700666+0.47194364j]
[-0.05897031+0.41193082j]
[ 0.2416082 +0.18812494j]]
```

———— Run time is 204.91505217552185 seconds ————

4.82 Equation 142

4.82.1 Qbits

$$h^{(142)}(\vec{r}) = 3.578504 > 3 \quad (227)$$

———— RESULTS ————

VIOLATION: 3.57850456840681

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.38644828+0.68740483j \\ -0.4598332 -0.40827166j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.16079106-0.095794j \\ 0.7943827 +0.5778632j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.39295164+0.12716653j \\ 0.04346021-0.90968615j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.35061528-0.86700152j \end{bmatrix}$

[0.00983651+0.35394989j]]

———— Run time is 1218.593269586563 seconds ————

4.82.2 Qtrits

$$h^{(142)}(\vec{r}) = 3.661188 > 3 \quad (228)$$

———— RESULTS ————

VIOLATION: 3.661188218934778

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.47386408+0.57355927j]
[0.13932211+0.65350742j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.25941101+0.14507531j]
[-0.6561232 -0.20051946j]
[-0.56544978-0.34816651j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.09591422+0.33861363j]
[-0.31522411+0.84572286j]
[0.20004285-0.14666542j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.64918049+0.32367544j]


```
[-0.48519336+0.24810125j]
[ 0.41925399+0.03252947j]]
```

Run time is 3121.1388030052185 seconds

4.82.3 Qquarts

$$h^{(142)}(\vec{r}) = 3.3838 > 3 \quad (229)$$

RESULTS

VIOLATION: 3.383881007405055

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.723029 +0.32087555j]
[0.56246366+0.24062955j]
[0. +0.j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.21822665+0.30910317j]
[0.54066865+0.4736226j]
[0.51221903+0.27896785j]
[0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.00060061+0.1986916j]
[0.54592795+0.7484892j]
[-0.29300417-0.12303376j]
[0.03073236-0.01773847j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52381687-0.40151402j \\ 0.49384896-0.06135862j \\ -0.2854415+0.40452308j \\ -0.26650706+0.02467631j \end{bmatrix}$

———— Run time is 925.1616954803467 seconds ————

4.83 Equation 143

4.83.1 Qbits

$$h^{(143)}(\vec{r}) = 3.6143 > 3 \quad (230)$$

RESULTS

VIOLATION: 3.614396127576158

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.06234167-0.60379327j \\ 0.25179505+0.75375491j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.04696318-0.37256326j \\ 0.62645234+0.68304359j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.47587872+0.74451881j \\ -0.44434923-0.14759722j \end{bmatrix}$

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.05217177-0.02037715j]
[0.09449894+0.9939481j]]

———— Run time is 1748.979516506195 seconds ————

4.83.2 Qtrits

$$h^{(143)}(\vec{r}) = 3.572098 > 3 \quad (231)$$

———— RESULTS ————

VIOLATION: 3.5720985516374304

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.38002865+0.56091898j]
[0.48896869+0.54941582j]
[0. +0.j]]

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.03516673+0.2050848j]
[-0.27524874+0.87521474j]
[0.1901083 +0.28071275j]]

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.03504906+0.44783452j]
[0.06453728+0.66487878j]
[0.55386538+0.21265016j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.22526401+0.37882259j \\ -0.1595479 +0.59975612j \\ -0.49820309-0.41518708j \end{bmatrix}$

———— Run time is 5758.3985760211945 seconds ————

4.83.3 Qquarts

$$h^{(143)}(\vec{r}) = 3.47384 > 3 \quad (232)$$

———— RESULTS ————

VIOLATION: 3.4738409480634784

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.57577191+0.47205794j \\ 0.35824967+0.56329849j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.38204625+0.17904186j \\ 0.50044084+0.6445218j \\ 0.3507311 +0.18199721j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```

[[-0.81283936+0.03128246j]
 [-0.3100994 -0.28982589j]
 [-0.33009417+0.02963959j]
 [-0.21922603-0.01588007j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[ 0.03721707-0.13910166j]
 [-0.7290066 -0.58874528j]
 [-0.06150708+0.02301747j]
 [ 0.28015325+0.13562899j]]

```

———— Run time is 4994.772368431091 seconds ————

4.84 Equation 144

4.84.1 Qbits

$$h^{(144)}(\vec{r}) = 3.62751 > 3 \quad (233)$$

RESULTS

VIOLATION: 3.6275160297067566

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[ 0.4576634 +0.61693099j]
 [-0.27663588+0.57741922j]]

```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[0.20802465+0.04035158j]
 [0.8381444 +0.50260468j]]

```

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.45257508+0.79500719j \\ -0.34697727-0.20675139j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.20535594-0.40744587j \\ 0.57530022-0.67885673j \end{bmatrix}$

———— Run time is 1384.4858305454254 seconds ————

4.84.2 Qtrits

$$h^{(144)}(\vec{r}) = 3.594307 > 3 \quad (234)$$

———— RESULTS ————

VIOLATION: 3.594307371349881

This is vector A:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.15386158+0.78291899j \\ 0.44792791+0.40339194j \\ 0. +0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.0179516 -0.30921217j \\ -0.79237104-0.43733871j \\ 0.20630965-0.20587592j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[ 0.14295378-0.64640235j]
 [ 0.15913854-0.38730938j]
 [-0.57679547-0.23173601j]]

```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[0.22681979+0.30939207j]
 [0.2172952 +0.70936378j]
 [0.46895966-0.2872142j ]]

```

———— Run time is 2783.623285293579 seconds ————

4.84.3 Qquarts

$$h^{(144)}(\vec{r}) = 3.370810 > 3 \quad (235)$$

———— RESULTS ————

VIOLATION: 3.3708104168776636

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.22709398+0.8069069j]
 [0.40180959+0.3686172j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.20141403+0.44928646j]
 [0.10697514+0.78763775j]
 [0.19347913+0.29719185j]
 [0.          +0.j       ]]

```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.59116133-0.3883613j ]
 [-0.03733529-0.27288007j]
 [-0.33177007+0.49914592j]
 [ 0.11914378-0.22457303j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.23167943+0.31163145j]
 [ 0.50113099-0.07210439j]
 [-0.53666333-0.40897384j]
 [ 0.20295506+0.31051776j]]
```

———— Run time is 3371.5638189315796 seconds ————

4.85 Equation 145

4.85.1 Qbits

$$h^{(145)}(\vec{r}) = 3.5386950 > 3 \quad (236)$$

RESULTS

VIOLATION: 3.5386950490679663

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[ 0.47821028-0.66195243j]
 [-0.54742301+0.1829261j ]]
```

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =


```
[[ 0.48254625+0.78056134j]
 [-0.35857204-0.17117011j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.40397227+0.2232823j ]
 [-0.6565568 -0.59656063j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.21099839+0.17600796j]
 [ 0.90340046+0.32919369j]]
```

———— Run time is 2935.9032378196716 seconds ————

4.85.2 Qtrits

$$h^{(145)}(\vec{r}) = 3.554156 > 3 \quad (237)$$

RESULTS

VIOLATION: 3.554156674254112

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.74688817+0.27426628j]
 [0.05362534+0.60337418j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.69158321-0.44750834j]
 [ 0.12387735-0.41352883j]
```

```
[-0.35775418+0.08431607j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.39486726+0.18189349j]
 [-0.17665545+0.87345169j]
 [ 0.116018 +0.05839038j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.08372168-0.18024315j]
 [ 0.47431547-0.6964287j ]
 [ 0.26780939+0.42283935j]]
```

———— Run time is 1014.9623603820801 seconds ————

4.85.3 Qquarts

$$h^{(145)}(\vec{r}) = 3.41482 > 3 \quad (238)$$

———— RESULTS ————

VIOLATION: 3.414828799572307

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.09983066+0.87738531j]
 [0.04502068+0.46712096j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```

Qobj data =
[[0.02976799+0.88161378j]
 [0.01215762+0.29274158j]
 [0.06332217+0.36333989j]
 [0.          +0.j          ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.37702067+0.22074961j]
 [-0.35013409+0.5330087j ]
 [-0.44461105+0.37928257j]
 [ 0.07805252-0.23410771j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 0.21919659-0.02044079j]
 [ 0.7092069  +0.29544755j]
 [-0.41114401+0.08762644j]
 [ 0.39493466-0.1690567j ]]

```

———— Run time is 1075.1191608905792 seconds ————

4.86 Equation 146

4.86.1 Qbits

$$h^{(146)}(\vec{r}) = 3.59874 > 3 \quad (239)$$

———— RESULTS ————

VIOLATION: 3.598742648572777

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[-0.16936652+0.77190479j]
 [-0.49794005-0.35711859j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.87688509+0.33668259j]
 [-0.01752155-0.34265195j]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.05010428-0.04331766j]
 [ 0.65336055-0.75414398j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.51567211+0.19491308j]
 [-0.70911587+0.43959737j]]

```

```

———— Run time is 1519.1962852478027 seconds ————

```

4.86.2 Qtrits

$$h^{(146)}(\vec{r}) = 3.6753292 > 3 \quad (240)$$

RESULTS

```

VIOLATION: 3.6753292664373944

```

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.52726291+0.45019256j]
 [0.57012675+0.44076749j]
 [0.          +0.j          ]]

```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.64163136+0.22030324j \\ -0.53160748+0.13171547j \\ 0.43272138-0.22928676j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.18098561-0.08377078j \\ 0.72207886-0.50966047j \\ 0.41497263-0.08290183j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.30594-0.06917829j \\ -0.83649124-0.21742906j \\ 0.38548356-0.07761775j \end{bmatrix}$

———— Run time is 3464.9556181430817 seconds ————

4.86.3 Qquarts

$$h^{(146)}(\vec{r}) = 3.597451 > 3 \quad (241)$$

———— RESULTS ————

VIOLATION: 3.59745175132553

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.40226946+0.68709816j \\ 0.37697681+0.47324824j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.46564035+0.54908394j]
 [0.55777207+0.0762847j ]
 [0.40486386+0.02901917j]
 [0.          +0.j          ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.15195541+0.04508991j]
 [ 0.71968108+0.21081107j]
 [-0.54167334-0.07011941j]
 [-0.03987707+0.33552551j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.47226978-0.03821523j]
 [-0.78502553+0.35125013j]
 [-0.13738024+0.07113972j]
 [-0.10606742+0.0259738j ]]

```

———— Run time is 2332.927318572998 seconds ————

4.87 Equation 147

4.87.1 Qbits

$$h^{(147)}(\vec{r}) = 3.611 > 3 \quad (242)$$

———— RESULTS ————

VIOLATION: 3.61120705062019

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.72685891+0.00755842j]
 [-0.07770763-0.68233461j]]
```

```
This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.58891983+0.73290381j]
 [0.10940871-0.32257585j]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.28382501-0.88238727j]
 [0.33539203+0.16836938j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.64155589+0.30461897j]
 [ 0.23721987+0.66282732j]]
```

———— Run time is 6020.561564445496 seconds ————

4.87.2 Qtrits

$$h^{(147)}(\vec{r}) = 3.57882 > 3 \quad (243)$$

———— RESULTS ————

VIOLATION: 3.578820816299386

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.6526237 +0.01979135j]
```

```
[0.67869276+0.33625399j]
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.74922602-0.26957337j]
 [-0.35059482-0.01541572j]
 [-0.39789066+0.29072189j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.41563973-0.59610903j]
 [ 0.0804307  -0.07610662j]
 [-0.42528012+0.52798972j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.76224787+0.13210993j]
 [ 0.46410106+0.07117394j]
 [-0.37814051-0.1951394j]]
```

———— Run time is 3847.4932940006256 seconds ————

4.87.3 Qquarts

$$h^{(147)}(\vec{r}) = 3.1429723 > 3 \quad (244)$$

RESULTS

VIOLATION: 3.1429723894975146

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```



```

Qobj data =
[[0.6284059+0.76103019j]
 [0.1081681+0.11932616j]
 [0.          +0.j      ]
 [0.          +0.j      ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.22183535+0.34518762j]
 [0.21411481+0.00175581j]
 [0.88190833+0.08957707j]
 [0.          +0.j      ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.68145493+0.36737791j]
 [-0.17320664-0.02876251j]
 [-0.30462092+0.51975939j]
 [ 0.07767851+0.02910596j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.03840623+0.44951058j]
 [ 0.38189589-0.4973401j ]
 [-0.05548941-0.35213203j]
 [ 0.3223132 -0.41510446j]]

```

———— Run time is 1935.4060325622559 seconds ————

4.88 Equation 148

4.88.1 Qbits

$$h^{(148)}(\vec{r}) = 3.624508 > 3 \quad (245)$$

———— RESULTS ————

VIOLATION: 3.6245083827396316

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```

```
[[1.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.59355551+0.48123265j]  
 [ 0.34348411+0.54600885j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.48527693-0.83130067j]  
 [-0.13726417-0.2336751j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.86378981-0.37278221j]  
 [ 0.17403928-0.29087955j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.43839495-0.59204644j]  
 [0.45577606+0.49955886j]]
```

———— Run time is 1681.1510462760925 seconds ————

4.88.2 Qtrits

$$h^{(148)}(\vec{r}) = 3.59893 > 3 \quad (246)$$

———— RESULTS ————

VIOLATION: 3.598938839571546

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.20561436+0.62208142j \\ 0.41991819+0.62801763j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33430212-0.56265464j \\ 0.03282395+0.12831418j \\ 0.13200568+0.7325943j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.41811946-0.57921438j \\ 0.18169321+0.18881793j \\ 0.44051168+0.47641542j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.39505964+0.76777372j \\ 0.19295437-0.28023679j \\ -0.28002614+0.245505j \end{bmatrix}$

Run time is 63791.77192091942 seconds

4.88.3 Qquarts

$$h^{(148)}(\vec{r}) = 3.2781 > 3 \quad (247)$$

RESULTS

VIOLATION: 3.2781104003999126

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

[0.]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.70602829+0.40176698j]
 [0.24491528+0.52926728j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.63803046+0.72018972j]
 [0.00728551+0.2710937j ]
 [0.01870851+0.01868202j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.52527129+0.51882208j]
 [  0.43451784+0.01648916j]
 [-0.2797464  +0.40237071j]
 [-0.07134366 -0.14347795j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.55943739-0.20453611j]
 [-0.69232697-0.07891915j]
 [ 0.14079957-0.33190965j]
 [-0.11288748+0.13006848j]]
```

———— Run time is 662.9448063373566 seconds ————

4.89 Equation 149

4.89.1 Qbits

$$h^{(149)}(\vec{r}) = 3.63115 > 3 \quad (248)$$

———— RESULTS ————

VIOLATION: 3.6311520996652558

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.15830084+0.735248j \\ -0.2040715 -0.62666263j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.86367584-0.32482188j \\ 0.30810561-0.23157227j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.23203976-0.74153406j \\ -0.2163602 -0.59116246j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.47955371+0.7692491j \\ -0.17749525-0.38311812j \end{bmatrix}$

———— Run time is 620.1639184951782 seconds ————

4.89.2 Qtrits

$$h^{(149)}(\vec{r}) = 3.6185 > 3 \quad (249)$$

———— RESULTS ————

VIOLATION: 3.6185105153551302

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.24257776+0.74908413j]
 [0.4329516 +0.43884155j]
 [0.          +0.j      ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.19278418+0.69173985j]
 [-0.20486353-0.57587125j]
 [-0.24534973+0.22480434j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.13639343-0.67720366j]
 [ 0.11709547+0.19176003j]
 [-0.36124118+0.58464827j]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.36083437+0.64263383j]
 [-0.3276334 -0.11724867j]
 [ 0.14305729+0.56148378j]]
```

```
———— Run time is 976.0187382698059 seconds ————
```

4.89.3 Qquarts

$$h^{(149)}(\vec{r}) = 3.263728 > 3 \quad (250)$$

RESULTS

VIOLATION: 3.2637287594033593

```
This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[0.03997924+0.00633463j]
 [0.78786584+0.61451521j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[0.74249924+0.22341919j]
 [0.05360281+0.03597815j]
 [0.62182041+0.08916527j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[-0.93857908+0.23237746j]
 [-0.06182244-0.07138409j]
 [ 0.16403034-0.16451303j]
 [ 0.02679293-0.03826197j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[-0.46613855-0.02647816j]
 [ 0.18695107+0.1306672j ]
 [-0.83704294+0.00974671j]
 [-0.08816609+0.14656054j]]
```

———— Run time is 228.76928424835205 seconds ————

4.90 Equation 150

4.90.1 Qbits

$$h^{(150)}(\vec{r}) = 3.60089 > 3 \quad (251)$$

———— Run time is 1208.8477056026459 seconds ————

———— RESULTS ————

VIOLATION: 3.600898664671657

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.13454595+0.65115346j \\ -0.55205424-0.50312292j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.87276885+0.19961604j \\ -0.40241102+0.19103233j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.26406632-0.69173372j \\ -0.19284686-0.64388161j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.13136643-0.95348667j \\ -0.1277123 -0.239365j \end{bmatrix}$

———— Run time is 2160.8746950626373 seconds ————

4.90.2 Qtrits

$$h^{(150)}(\vec{r}) = 3.59109 > 3 \quad (252)$$

———— RESULTS ————

VIOLATION: 3.591093248226218

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.06447959+0.71161351j]
 [0.53497787+0.45082954j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.77684601+0.12758768j]
 [  0.03659811-0.11147643j]
 [  0.08522944-0.59933395j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[  0.24368074+0.65215306j]
 [-0.49653737-0.10909505j]
 [  0.46766722+0.19532628j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.292379   +0.7531896j ]
 [-0.14140638-0.20043246j]
 [-0.3669087  -0.39042159j]]
```

———— Run time is 2837.6173527240753 seconds ————

4.90.3 Qquarts

$$h^{(150)}(\vec{r}) = 3.428889 > 3 \quad (253)$$

———— RESULTS ————

VIOLATION: 3.428889503251633

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.53822166+0.50065214j \\ 0.61653159+0.28205262j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.59155493+0.46097109j \\ 0.16204396+0.12746668j \\ 0.09297278+0.62162568j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.73380483+0.18962219j \\ -0.44367335+0.01451878j \\ -0.24886806-0.40546319j \\ 0.01717934+0.04343054j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.58233291+0.1156807j \\ -0.4097948 +0.2974187j \\ 0.23098574+0.55152108j \\ -0.17945978+0.03716147j \end{bmatrix}$

———— Run time is 45.491950035095215 seconds ————

4.91 Equation 151

4.91.1 Qbits

$$h^{(151)}(\vec{r}) = 3.61100 > 3 \quad (254)$$

RESULTS

VIOLATION: 3.6110076901921913

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.60036688+0.11994797j \\ 0.16958174-0.77227853j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.83440223-0.01359965j \\ 0.02732743-0.55031007j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.04033059+0.97800254j \\ -0.19180604-0.07137868j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.29976151+0.85815382j \\ 0.39707639+0.12667043j \end{bmatrix}$

Run time is 1190.645120382309 seconds

4.91.2 Qtrits

$$h^{(151)}(\vec{r}) = 3.5634 > 3 \quad (255)$$

RESULTS

VIOLATION: 3.563441963489433

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.4399125+0.34472391j]  
 [0.5096425+0.65414596j]  
 [0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[−0.87114524−0.28857301j]  
 [ 0.24495709+0.12977657j]  
 [−0.00769458+0.28447575j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.65475046+0.41403699j]  
 [−0.29482219−0.18829961j]  
 [ 0.15226738+0.50429454j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.68043159+0.27682864j]  
 [−0.10727784+0.10265808j]  
 [ 0.27983269+0.600021j  ]]
```

Run time is 2900.0888130664825 seconds

4.91.3 Qquarts

$$h^{(151)}(\vec{r}) = 3.16874 > 3 \quad (256)$$

RESULTS

VIOLATION: 3.1687481719950763

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.00480072+0.87977586j]
 [0.47270073+0.05025349j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.73058858+0.07749799j]
 [0.03970446+0.67217007j]
 [0.05036945+0.06563743j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.26929819+0.39922407j]
 [  0.08049311-0.62006299j]
 [  0.48735369-0.05768944j]
 [-0.36881204+0.0166544j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.6520919  -0.0491471j ]
 [  0.04901922+0.40660782j ]
 [-0.40199209+0.2666644j ]
 [  0.19815232-0.36421974j ]]
```

———— Run time is 1329.7445363998413 seconds ————

4.92 Equation 152

4.92.1 Qbits

$$h^{(152)}(\vec{r}) = 3.60888 > 3 \quad (257)$$

———— RESULTS ————

VIOLATION: 3.608887212556208

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.42056855+0.71200272j \\ 0.04747083-0.56028629j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.48876572+0.46609339j \\ 0.19672887+0.71074804j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.21609993+0.91073822j \\ -0.01426037-0.35164379j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.3776612 +0.82736696j \\ -0.41096047+0.06282848j \end{bmatrix}$

———— Run time is 2074.48783159256 seconds ————

4.92.2 Qtrits

$$h^{(152)}(\vec{r}) = 3.5869 > 3 \quad (258)$$

RESULTS

VIOLATION: 3.586912091073156

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.13211812+0.64151397j]  
 [0.20889384+0.72620107j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.79674766+0.39205084j]  
 [-0.20096438-0.16569965j]  
 [-0.09604419+0.36663575j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.23037992+0.6545422j]  
 [-0.13788926+0.11501201j]  
 [ 0.59437123-0.36466591j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.43115015+0.52173556j]  
 [-0.33050232-0.26260134j]  
 [ 0.39720317-0.45380608j]]
```

Run time is 1490.0397300720215 seconds

4.92.3 Qquarts

$$h^{(152)}(\vec{r}) = 3.2900 > 3 \quad (259)$$

RESULTS

VIOLATION: 3.2900396502871585

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.22287085+0.71632095j]  
 [0.66113153+0.01086199j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.57553935+0.12316466j]  
 [0.00174538+0.22824078j]  
 [0.46027309+0.62420887j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.22774468-0.8186442j ]  
 [-0.04177597+0.41164986j]  
 [-0.20228115+0.13667439j]  
 [-0.17742586-0.12520267j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.16536407+0.80183432j ]
```

```

[ -0.40060956 -0.23827894j ]
[ -0.17806133 -0.03755588j ]
[  0.06571324 +0.27389244j ]]

```

———— Run time is 558.5004444122314 seconds ————

4.93 Equation 153

4.93.1 Qbits

$$h^{(153)}(\vec{r}) = 3.4959 > 3$$

$$h^{(153)}(\vec{r}) = 3.5686 > 3$$

$$h^{(153)}(\vec{r}) = 3.6750 > 3 \tag{260}$$

———— RESULTS ————

VIOLATION: 3.4959161009272552

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.17345702 -0.29410396j]
[-0.27952772 +0.89737382j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.16173354 -0.01108584j]
[-0.03336166 -0.98620807j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.00753221 -0.0551112j]
[0.44740648 -0.89259927j]]

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.7320463 & -0.5235813j \\ -0.43486651 & -0.02935914j \end{bmatrix}$

Run time is 33.2982017993927 seconds

RESULTS

VIOLATION: 3.568637466837781

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.1399355 & +1.86464264e-04j \\ 0.90157434 & -4.09367487e-01j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.05488838 & +0.43590713j \\ 0.55091945 & +0.70954915j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.32786235 & -0.19204514j \\ -0.13611431 & +0.91493051j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.68773209 & +0.42480673j \\ -0.07472132 & +0.58393539j \end{bmatrix}$

Run time is 50.99919891357422 seconds

RESULTS

VIOLATION: 3.675071455595414

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.02726732+0.32359412j \\ 0.3705589 +0.87018931j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.21624505+0.11848553j \\ 0.90468382+0.34748589j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.26298585+0.16730064j \\ -0.60209975-0.7350679j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.14509562+0.77199635j \\ -0.14936388+0.60054919j \end{bmatrix}$

———— Run time is 1927.301036119461 seconds ————

4.93.2 Qtrits

$$\begin{aligned} h^{(153)}(\vec{r}) &= 3.257 > 3 \\ h^{(153)}(\vec{r}) &= 3.395 > 3 \end{aligned} \tag{261}$$

———— RESULTS ————

VIOLATION: 3.2572026076312883

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.55441292+0.03575662j \\ 0.28278353+0.78190873j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25664738-0.19392371j \\ -0.14472328+0.56465254j \\ -0.74566603-0.02702895j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24239495-0.18884976j \\ -0.32800442+0.42944332j \\ -0.75896797-0.19375143j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.69508224-0.39888205j \\ 0.21178213+0.555753j \\ -0.04735231-0.04240851j \end{bmatrix}$

———— Run time is 71.66263246536255 seconds ————

———— RESULTS ————

VIOLATION: 3.395943077938269

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.18634791+0.28333395j]
 [0.73454335+0.58774347j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.06740979-0.21302022j]
 [-0.70429576-0.57824315j]
 [0.06407302+0.33996366j]]

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.37508075+0.42959807j]
 [-0.24711518-0.68628213j]
 [0.08143463+0.36888921j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.33180204-0.54021496j]
 [0.24394694-0.70185625j]
 [-0.21430544+0.00600632j]]

———— Run time is 494.66789746284485 seconds ————

4.93.3 Qquarts

$$h^{(153)}(\vec{r}) = 3.110 > 3 \quad (262)$$

———— RESULTS ————

VIOLATION: 3.1102453351093553

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.15970477+0.35954867j]
 [0.20187252+0.89692064j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.26467558+0.15628651j]
 [0.34446433+0.34840711j]
 [0.77553975+0.25301437j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.34025067+0.12245187j]
 [  0.01828457+0.21870854j]
 [ -0.58294846+0.64724433j]
 [ -0.18697309-0.16539108j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.64609503-0.35393753j]
 [ 0.61985551+0.0999868j ]
 [ 0.13072845-0.1847975j ]
 [-0.09988887-0.0430511j ]]
```

———— Run time is 328.2751045227051 seconds ————

4.94 Equation 154

4.94.1 Qbits

$$h^{(154)}(\vec{r}) = 3.5403 > 3$$

$$h^{(154)}(\vec{r}) = 3.5477 > 3$$

$$\begin{aligned}
h^{(154)}(\vec{r}) &= 3.5646 > 3 \\
h^{(154)}(\vec{r}) &= 3.6729 > 3
\end{aligned}
\tag{263}$$

RESULTS

VIOLATION: 3.540351188930522

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
[0.]]

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.02996134+0.05980521j]
[-0.9930598 +0.09673619j]]

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.21813201+0.11159682j]
[0.18295073-0.95209958j]]

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.16307929-0.62244616j]
[0.72643043+0.24138094j]]

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.34631531+0.40812042j]
[0.43564496-0.72368287j]]

Run time is 754.4275512695312 seconds

RESULTS

VIOLATION: 3.547709755966889

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.29775213-0.0464423j ]
 [0.13881407+0.94335435j ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.11852896-0.16378632j ]
 [0.75370685-0.62534064j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.16707562-0.74149786j ]
 [ 0.17532779-0.62572104j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.04243744+0.22268094j ]
 [0.48887883-0.84238337j ]]
```

```
———— Run time is 769.8026790618896 seconds ————
———— RESULTS ————
```

VIOLATION: 3.564631120026077

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.44672221-0.24592757j ]]
```



```
[ 0.03217311-0.85960676j]]
```

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[ -0.32316496-0.04908443j]
 [ -0.88453768-0.33278855j]]
```

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[ -0.84406482+0.01737039j]
 [ -0.45633147-0.28109508j]]
```

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[ 0.01565234+2.09109942e-04j]
 [ -0.70962372+7.04406945e-01j]]
```

———— Run time is 855.171229839325 seconds ————

———— RESULTS ————

VIOLATION: 3.6729051517536266

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[ 1.]
 [ 0.]]
```

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[ 0.03475261+0.28849782j]
 [ -0.86171476+0.41594342j]]
```

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

```
[[ 0.04757204-0.22306916j]
 [ 0.48991506+0.84140376j]]
```

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.66730818 - 0.21112681j \\ 0.1171712 + 0.70455388j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.10854147 - 0.31975581j \\ -0.94047107 + 0.03858922j \end{bmatrix}$

———— Run time is 883.0332324504852 seconds ————

4.94.2 Qtrits

$$h^{(154)}(\vec{r}) = 3.406 > 3 \quad (264)$$

———— RESULTS ————

VIOLATION: 3.406270857279932

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.40042572 + 0.23988207j \\ 0.5142198 + 0.71950943j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.09396035 - 0.15588805j \\ 0.13796008 - 0.46609743j \\ -0.84998433 + 0.09009557j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.76563086-0.24070971j \\ -0.31659909-0.46199738j \\ 0.00514099+0.20534174j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.29136426-0.17949936j \\ -0.65311771+0.17809394j \\ -0.09232592+0.64504464j \end{bmatrix}$

———— Run time is 477.6719083786011 seconds ————

4.94.3 Qquarts

$$h^{(154)}(\vec{r}) = 3.0074 > 3 \quad (265)$$

———— RESULTS ————

VIOLATION: 3.0074866804002705

This is vector A:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.67086017+0.03280651j \\ 0.32175982+0.66733873j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.2149341 +0.31657185j \\ 0.39547761+0.55797729j \\ 0.27359849+0.55766322j \\ 0. & +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.37592394+0.75677661j \\ -0.3905783 +0.27707835j \\ -0.12132971+0.12349056j \\ -0.08522029+0.13933134j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.03098571-0.23136298j \\ -0.57686963-0.30218851j \\ -0.60182252-0.38239231j \\ -0.0456184 +0.10449558j \end{bmatrix}$

———— Run time is 248.79517078399658 seconds ————

4.95 Equation 155

4.95.1 Qbits

$$h^{(155)}(\vec{r}) = 3.69869 > 3 \quad (266)$$

———— RESULTS ————

VIOLATION: 3.6986989903708536

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.13410331+0.17450611j \\ 0.73975132-0.63587098j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.18699344+0.98118653j \end{bmatrix}$

```
[-0.04798837-0.00188919j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.44710951+0.73365238j]
 [-0.51125186-0.02165187j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.51223155-0.69677851j]
 [-0.48994628-0.109869j  ]]
```

———— Run time is 4021.0773537158966 seconds ————

4.95.2 Qtrits

$$h^{(155)}(\vec{r}) = 3.460125 > 3 \quad (267)$$

———— RESULTS ————

VIOLATION: 3.460125710643077

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.24873745+0.45108947j]
 [0.7867399 +0.34012982j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.4025433 +0.00255666j]
 [-0.03151067-0.39529467j]
 [ 0.61009416+0.55541576j]]
```

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.44201012-0.32935385j \\ 0.32194692+0.05021416j \\ -0.19503255+0.74292942j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07820689+0.78446796j \\ 0.3503512 +0.47375679j \\ -0.15769178-0.08022179j \end{bmatrix}$

———— Run time is 3811.246976852417 seconds ————

4.95.3 Qquarts

$$h^{(155)}(\vec{r}) = 3.2421346 > 3 \quad (268)$$

———— RESULTS ————

VIOLATION: 3.2421346216015494

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.01824311+0.29920295j \\ 0.95319844+0.03946545j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[0.4656607 +0.36722169j]
 [0.23772842+0.37780556j]
 [0.61359941+0.26935528j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.19049522+0.87913371j]
 [ -0.21546917-0.3349664j ]
 [ -0.13706905-0.02750121j]
 [ -0.00572385-0.11237902j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.2286327 -0.48106977j]
 [ -0.75270287-0.11851756j]
 [ -0.26838128-0.17213986j]
 [ -0.01847066+0.18354597j ]]
```

———— Run time is 4726.241515874863 seconds ————

4.96 Equation 156

4.96.1 Qbits

$$h^{(156)}(\vec{r}) = 3.674295 > 3 \quad (269)$$

———— RESULTS ————

VIOLATION: 3.674295673460929

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.19010445-0.26957906j]
 [-0.7233449 -0.60659672j ]]
```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.9706812 + 0.18375308j \\ -0.13903437 + 0.06842707j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.140341 - 0.81037908j \\ -0.5666239 + 0.05027423j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.39340013 - 0.77771678j \\ 0.38986082 + 0.29732387j \end{bmatrix}$

———— Run time is 10540.90943479538 seconds ————

4.96.2 Qtrits

$$h^{(156)}(\vec{r}) = 3.498722 > 3 \quad (270)$$

———— RESULTS ————

VIOLATION: 3.4987228875237695

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.39902183 + 0.08282445j \\ 0.43911732 + 0.80068575j \\ 0. + 0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.7356924 & -0.21322233j \\ -0.0212711 & -0.14555047j \\ 0.57633591 & +0.24391073j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.77884188 & -0.17403966j \\ 0.38664147 & +0.44662821j \\ -0.07354046 & +0.09348222j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.48498687 & -0.48236346j \\ -0.3999205 & -0.16562627j \\ -0.49498187 & +0.31581279j \end{bmatrix}$

———— Run time is 45157.442220687866 seconds ————

4.96.3 Qquarts

$$h^{(156)}(\vec{r}) = 3.24705 > 3 \quad (271)$$

RESULTS

VIOLATION: 3.2470578913608827

This is vector A:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.13022507 & +0.06575742j \\ 0.19219062 & +0.97045358j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.05674402+0.62068384j]
 [0.0748449 +0.05533288j]
 [0.14846027+0.76212056j]
 [0.          +0.j          ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.40981408+0.74875528j]
 [-0.29850012+0.35077592j]
 [-0.04635344+0.21697216j]
 [-0.05032244-0.08668318j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.22393995-0.25192608j]
 [-0.02209476+0.26575295j]
 [ 0.2933343 -0.81446381j]
 [-0.22326972-0.12659246j]]

```

```

Run time is 5279.02211689949 seconds

```

4.97 Equation 157

4.97.1 Qbits

$$h^{(157)}(\vec{r}) = 3.67937 > 3 \quad (272)$$

```

RESULTS

```

```

VIOLATION: 3.67937769926281

```

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

```
Qobj data =
[[ -0.08137339+0.1304453j ]
 [ -0.98794461-0.01810659j ]]
```

```
This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.2017624 -0.11621133j]
 [-0.85372805+0.46576311j]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.30859023-0.07953319j]
 [-0.69108495-0.64872808j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.52263209-0.52688274j]
 [-0.1287179 -0.65778567j]]
```

———— Run time is 4166.198064088821 seconds ————

4.97.2 Qtrits

$$h^{(157)}(\vec{r}) = 3.58941 > 3 \quad (273)$$

———— RESULTS ————

VIOLATION: 3.589410524078616

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 1.]
 [ 0.]
 [ 0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.03197928+0.26972184j]
 [0.00434234+0.96239732j]
 [0.          +0.j          ]]
```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.10435414-0.19524318j]
 [ 0.5690131 +0.75406423j]
 [-0.00391787+0.24204585j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.03290242+0.25332066j]
 [ 0.458239 +0.5159467j]
 [ 0.43721828+0.51710954j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.00364495+0.78041485j]
 [0.26455553+0.49389176j]
 [0.16488703+0.22323293j]]

```

```

Run time is 2527.479026079178 seconds
Run time is 15428.56734251976 seconds

```

4.97.3 Qquarts

$$h^{(157)}(\vec{r}) = 3.08830 > 3 \quad (274)$$

RESULTS

VIOLATION: 3.0883022981440824

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =

```

```
[[0.10410635+0.00959016j]
 [0.9091642 +0.40310093j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.20064935+0.24916688j]
 [0.41576087+0.84808484j]
 [0.02409399+0.07049957j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.11813035-0.33657841j]
 [  0.21552011-0.19089738j]
 [-0.43839531-0.21080174j]
 [  0.01132944+0.74371587j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.39274851+0.74389911j]
 [-0.17499334-0.17764663j]
 [  0.03765141+0.33169958j]
 [  0.34274172+0.0356033j ]]
```

———— Run time is 2445.3328034877777 seconds ————

4.98 Equation 158

4.98.1 Qbits

$$h^{(158)}(\vec{r}) = 3.709117 > 3 \quad (275)$$

———— RESULTS ————

VIOLATION: 3.709117997700257

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.3019164 -0.26511059j]
 [-0.18416123-0.89702146j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.21952574+0.24614173j]
 [ 0.91876097-0.21702762j]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.67970146+0.5613238j ]
 [0.14253169+0.45011802j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.82933574+0.03104135j]
 [-0.43507228-0.34921451j]]

```

```

———— Run time is 6557.487116098404 seconds ————

```

4.98.2 Qtrits

$$h^{(158)}(\vec{r}) = 3.5268 > 3 \quad (276)$$

```

———— RESULTS ————

```

```

VIOLATION: 3.526828034502428

```

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

```

Qobj data =
[[0.34903487+0.18009302j]
 [0.8035875  +0.4472005j ]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.15528476+0.0891902j ]
 [-0.01976169-0.89467669j]
 [-0.23160891-0.33682662j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.50876882-0.80171206j]
 [ 0.03794135-0.22009667j]
 [-0.13270821-0.17583658j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.7068617  +0.2092809j ]
 [ 0.57439919-0.07905363j]
 [-0.21563357+0.27178355j]]

```

———— Run time is 3542.405566215515 seconds ————

4.98.3 Qquarts

$$h^{(158)}(\vec{r}) = 3.287620 > 3 \quad (277)$$

———— RESULTS ————

VIOLATION: 3.287620174361053

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.54642132+0.02580012j]
 [0.56049399+0.62177535j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.10708817+0.32644069j]
 [0.81703608+0.00732818j]
 [0.41365903+0.20797391j]
 [0.          +0.j       ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.76739807-0.23140411j]
 [ 0.36597105+0.42271147j]
 [ 0.07910149-0.06770709j]
 [-0.03895829-0.18048129j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.4100771 -0.77500294j]
 [0.38439543-0.1734258j ]
 [0.03471085+0.07435837j]
 [0.17664697-0.1242284j ]]

```

———— Run time is 5813.4506957530975 seconds ————

4.99 Equation 159

4.99.1 Qbits

$$h^{(159)}(\vec{r}) = 3.681 > 3 \quad (278)$$

———— RESULTS ————

VIOLATION: 3.6816203228304283

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```



```
[[1.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.11631842-0.24600498j]  
 [-0.88125145-0.38645498j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.08837961+0.20094394j]  
 [-0.62319741-0.75062345j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.60520568-0.41951841j]  
 [-0.25089587+0.62831652j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.02575196+0.27222318j]  
 [ 0.78399139-0.55730501j]]
```

———— Run time is 5959.930547714233 seconds ————

4.99.2 Qtrits

$$h^{(159)}(\vec{r}) = 3.513 > 3 \quad (279)$$

RESULTS

VIOLATION: 3.513151195611587

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.1023892 + 0.13815485j \\ 0.69138189 + 0.701727j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.14010298 + 0.14475559j \\ -0.88719784 - 0.25398365j \\ -0.11137392 - 0.30884481j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33197976 + 0.74861009j \\ 0.31374361 + 0.41319675j \\ 0.24366056 - 0.02890145j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11961477 - 0.37438523j \\ -0.7102587 - 0.38017435j \\ -0.44247507 - 0.02727379j \end{bmatrix}$

———— Run time is 5080.649422168732 seconds ————

4.99.3 Qquarts

$$h^{(159)}(\vec{r}) => 3 \quad (280)$$

———— RESULTS ————

VIOLATION: 3.178396336028876

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.09780673+0.46413751j] \\ [0.84741309+0.23853986j] \\ [0. +0.j] \\ [0. +0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.00728861+0.04311244j] \\ [0.54551607+0.5195797j] \\ [0.24599623+0.60829532j] \\ [0. +0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.808631 +0.29808395j] \\ [0.05071427+0.31777398j] \\ [-0.0653374 -0.33409601j] \\ [-0.08174184+0.17646182j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.11792471+0.44303537j] \\ [-0.01300175+0.10931281j] \\ [-0.46945641-0.49984426j] \\ [0.16388738+0.52971917j] \end{bmatrix}$

———— Run time is 2121.2984335422516 seconds ————

4.100 Equation 160

4.100.1 Qbits

$$h^{(160)}(\vec{r}) = 3.6840324 > 3 \quad (281)$$

———— RESULTS ————

VIOLATION: 3.6840324523034895

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25466642-0.16121172j \\ -0.76084229+0.57469541j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.73235598+0.49096118j \\ -0.39860623+0.25243795j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.79801677-0.58623745j \\ -0.00939754+0.13930749j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.77715297-0.04626704j \\ 0.62110984+0.0900843j \end{bmatrix}$

Run time is 3348.677328109741 seconds

4.100.2 Qtrits

$$h^{(160)}(\vec{r}) = 3.473878 > 3 \quad (282)$$

RESULTS

VIOLATION: 3.4738785156658256

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.18388897+0.06752503j]
 [0.50266763+0.84199197j]
 [0.          +0.j       ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.89897878+0.00542514j]
 [-0.25058084-0.35837246j]
 [-0.00771856+0.02294713j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.70577111+0.49615536j]
 [ 0.2431538  +0.1160973j ]
 [-0.06840029+0.42241691j]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.63506377+0.43341891j]
 [0.19676769+0.49574499j]
 [0.10877749+0.33545328j]]
```

```
———— Run time is 3858.5851674079895 seconds ————
```

4.100.3 Qquarts

$$h^{(160)}(\vec{r}) = 3.25173 > 3 \quad (283)$$

```
———— RESULTS ————
```

```
VIOLATION: 3.2517389459945356
```

```
This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
```

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =
 [[0.00750689+0.10410909j]
 [0.70550865+0.70097253j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =
 [[0.64810607+0.4817076j]
 [0.32153193+0.34741596j]
 [0.0428276 +0.34928709j]
 [0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =
 [[0.81958582-0.05268375j]
 [-0.17725932-0.0494052j]
 [-0.34571066-0.14134587j]
 [0.28405859+0.26731624j]]

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =
 [[-0.68025922+0.31208609j]
 [0.57869655+0.11343046j]
 [0.22433446-0.04515256j]
 [-0.19902984-0.01076667j]]

———— Run time is 6306.679402112961 seconds ————
 ———— Run time is 8781.18476653099 seconds ————

4.101 Equation 161

4.101.1 Qbits

$$h^{(161)}(\vec{r}) = 3.6904501 > 3 \quad (284)$$

RESULTS

VIOLATION: 3.690450138661528

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.44401539 - 0.16929984j \\ 0.80256687 + 0.36065818j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.38231041 + 0.81166888j \\ -0.27258771 - 0.3474598j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.14714876 + 0.10589252j \\ 0.97006652 + 0.16157031j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.19073145 - 0.81548593j \\ -0.11119371 + 0.53501418j \end{bmatrix}$

Run time is 1318.2433500289917 seconds

4.101.2 Qtrits

$$h^{(161)}(\vec{r}) = 3.434465 > 3 \quad (285)$$

RESULTS

VIOLATION: 3.4344655074441426

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.1272453 + 0.40572175j \\ 0.16543868 + 0.88984748j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.20844988 + 0.69290984j \\ 0.35752169 + 0.48259119j \\ -0.19867012 + 0.27611367j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.29163705 - 0.19568357j \\ -0.44141149 + 0.80989206j \\ -0.15041393 - 0.05711538j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.61832312 - 0.39436555j \\ -0.4641157 - 0.08988789j \\ -0.03138098 + 0.48752882j \end{bmatrix}$

———— Run time is 1262.4819610118866 seconds ————

4.101.3 Qquarts

$$h^{(161)}(\vec{r}) = 3.34877 > 3 \quad (286)$$

———— RESULTS ————

VIOLATION: 3.348776516395858

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.30443539+0.19765841j]  
 [0.60788493+0.70620546j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.25425813+0.76641765j]  
 [0.19475816+0.54688633j]  
 [0.07044016+0.07732769j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.02386189-0.24248843j]  
 [ 0.1059984  +0.76262423j]  
 [ 0.20591373+0.2031092j ]  
 [-0.2184226  +0.46522721j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.59971029+0.49106727j]  
 [ 0.23399332+0.53264388j]  
 [ 0.00960333-0.00620046j]  
 [-0.0539212  -0.24020819j]]
```

———— Run time is 1098.3702142238617 seconds ————

4.102 Equation 162

4.102.1 Qbits

$$h^{(162)}(\vec{r}) = 3.6700 > 3 \quad (287)$$

————— RESULTS —————

VIOLATION: 3.6700598211176474

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.07972785+0.51238903j \\ 0.58894358+0.61987612j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.65151281-0.70586708j \\ -0.27400386-0.0469532j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.81587323+0.23795307j \\ -0.2151007 +0.48110383j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.07540026+0.07453891j \\ 0.21170412-0.97156581j \end{bmatrix}$

————— Run time is 2049.584605693817 seconds —————

4.102.2 Qtrits

$$h^{(162)}(\vec{r}) = 3.4856 > 3 \quad (288)$$

RESULTS

VIOLATION: 3.4856707903678825

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.11258642+0.12349758j]
 [0.42123242+0.89142352j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.37095433-0.27166362j]
 [ 0.29726133-0.69621006j]
 [-0.39761715-0.23962394j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.85503529-0.02939045j]
 [ 0.32221395+0.40066995j]
 [-0.02152135+0.05682823j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.1014322 +0.19982445j]
 [ 0.76772105-0.43332962j]
 [ 0.07417678+0.40879008j]]
```

Run time is 1413.4103705883026 seconds

4.102.3 Qquarts

$$h^{(162)}(\vec{r}) = 3.389431 > 3 \quad (289)$$

RESULTS

VIOLATION: 3.3894319136597924

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.04103621+0.36414908j]
 [0.38877211+0.84532108j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.31878076+0.76890538j]
 [0.40031615+0.33679962j]
 [0.02668694+0.18100868j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.55570433+0.49084468j]
 [ 0.5290916  +0.35254053j]
 [-0.06539995-0.09547284j]
 [-0.18060331+0.00562922j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.2382126  -0.24428335j]
 [ 0.38080366+0.77659033j]
 [-0.33650153-0.01081144j]
 [ 0.14263203+0.04221818j]]
```

Run time is 2906.922957420349 seconds

4.103 Equation 163

4.103.1 Qbits

$$h^{(163)}(\vec{r}) = 3.6815434 > 3 \quad (290)$$

————— RESULTS —————

VIOLATION: 3.681543409606085

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.18637295+0.12488129j \\ -0.15027419-0.96285381j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.89657239-0.32291409j \\ -0.02063909-0.30242101j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.23695629-0.7248649j \\ -0.64354973-0.06531722j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.28653605+0.93546479j \\ 0.12803997+0.16250687j \end{bmatrix}$

————— Run time is 2226.1059699058533 seconds —————

4.103.2 Qtrits

$$h^{(163)}(\vec{r}) = 3.56366 > 3 \quad (291)$$

RESULTS

VIOLATION: 3.5636663380158593

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.09903041+0.06371546j]
 [0.83991386+0.52979056j]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.45563939+0.80502145j]
 [ -0.01496659-0.31845881j]
 [ -0.20647647-0.0077889j ]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.40421505-0.45771635j]
 [-0.07462418-0.7309721j ]
 [ 0.2951891  +0.00896364j ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.01230254+0.81474875j]
 [ 0.16960756-0.02721214j]
 [-0.41004437+0.3720074j ]]
```

Run time is 5566.712069749832 seconds

4.103.3 Qquarts

$$h^{(163)}(\vec{r}) = 3.189032 > 3 \quad (292)$$

RESULTS

VIOLATION: 3.189032898223571

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.20321687+0.05945807j]
 [0.68467217+0.69741785j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.40466777+0.6712076j ]
 [0.25386247+0.08434723j]
 [0.48919985+0.27358225j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.41555225-0.24949054j]
 [ 0.02541461+0.81355715j]
 [-0.25466425-0.08327758j]
 [ 0.17498445+0.01187723j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.53626317-0.01072272j]
 [ 0.4761783  -0.04252399j]
 [ 0.18892018+0.51012309j]
 [-0.0866146  -0.42465785j]]
```

———— Run time is 1625.753996372223 seconds ————

4.104 Equation 164

4.104.1 Qbits

$$h^{(164)}(\vec{r}) = 3.6976 > 3 \quad (293)$$

———— RESULTS ————

VIOLATION: 3.697657496807895

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.14051409+0.25374484j \\ -0.77382921+0.56307877j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.73370818-0.19313087j \\ 0.50581961+0.41051103j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.01518637+0.25952628j \\ -0.80992118+0.52577864j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.3059718-0.05482903j \\ -0.54560787-0.77825901j \end{bmatrix}$

———— Run time is 554.5331432819366 seconds ————

4.104.2 Qtrits

$$h^{(164)}(\vec{r}) = 3.35024 > 3 \quad (294)$$

RESULTS

VIOLATION: 3.35024668718716

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.50189712+0.10265039j]  
 [0.51452913+0.6876205j ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.48949715-0.75271175j]  
 [ 0.4337022  -0.0751884j]  
 [-0.00060846-0.00814277j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.08057396-0.05344453j]  
 [ 0.09058906-0.06087074j]  
 [-0.56363681+0.81305193j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.04753415-0.11170629j]  
 [-0.52121644+0.02555826j]  
 [ 0.63289816+0.55891173j]]
```

Run time is 1639.0241889953613 seconds

4.104.3 Qquarts

$$h^{(164)}(\vec{r}) = 3.4798 > 3 \quad (295)$$

RESULTS

VIOLATION: 3.479883855366319

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.21686829+0.1529974j]  
 [0.52375323+0.8094705j]  
 [0.          +0.j       ]  
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.55910304+0.47042938j]  
 [0.30001055+0.59779904j]  
 [0.12309206+0.05981906j]  
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.00148371+0.13552104j]  
 [-0.11503067+0.87037267j]  
 [-0.03212013+0.44756954j]  
 [ 0.08691484+0.04412276j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.09249987-0.35776951j]  
 [-0.3472546  +0.82034769j]]
```

```
[ 0.12489956-0.03574081j]
[-0.00069649+0.23024088j]]
```

———— Run time is 3190.4698255062103 seconds ————

4.105 Equation 165

4.105.1 Qbits

$$h^{(165)}(\vec{r}) = 3.6847054 > 3 \quad (296)$$

———— RESULTS ————

VIOLATION: 3.6847054646788697

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.18456269+0.26114077j]
[-0.90657001+0.27545041j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.72421686-0.33851069j]
[0.31767976-0.50990198j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.61011882+0.78513008j]
[-0.01788432+0.10490916j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.23758517-0.8473808j]
[-0.44662581-0.16132097j]]

———— Run time is 6005.5446672439575 seconds ————

4.105.2 Qtrits

$$h^{(165)}(\vec{r}) = 3.5055 > 3 \quad (297)$$

———— RESULTS ————

VIOLATION: 3.505599180055152

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.14904 +0.34967388j]  
 [0.69844955+0.6063691j]  
 [0. +0.j ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.33341258 -0.80336374j]  
 [ -0.08006067 -0.46399416j]  
 [ 0.12853065 -0.07226572j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.26653557 -0.76357984j]  
 [ 0.41466233 +0.01368276j]  
 [ 0.35729532 -0.21473847j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.6857344 -0.44091005j]  
 [ 0.54401118 +0.08713314j]  
 [ 0.16495287 -0.06794746j]]
```

———— Run time is 870.2632484436035 seconds ————

4.105.3 Qquarts

$$h^{(165)}(\vec{r}) = 3.385679 > 3 \quad (298)$$

RESULTS

VIOLATION: 3.3856795861472166

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.0424887 +0.09532885j]  
 [0.54534659+0.83168757j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.54540568+0.15757174j]  
 [0.51792954+0.51859496j]  
 [0.30443807+0.2186996j ]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.62779418-0.10920039j]  
 [-0.34791    -0.03634485j]  
 [-0.5179145  -0.27860052j]  
 [-0.25697014+0.24433603j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```

Qobj data =
[[ 0.75672236-0.53197201j]
 [-0.30160902+0.10834662j]
 [ 0.01706735-0.04491637j]
 [-0.04275238-0.19373573j]]

```

———— Run time is 1169.0553250312805 seconds ————

4.106 Equation 166

4.106.1 Qbits

$$h^{(166)}(\vec{r}) = 3.691589 > 3 \quad (299)$$

———— RESULTS ————

VIOLATION: 3.6915899493047277

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[ 0.15673196-0.21333834j]
 [-0.94910279-0.17066263j]]

```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[0.64790354+0.40767032j]
 [0.2532518 -0.59151454j]]

```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[-0.00676125+0.22856984j]
 [-0.96458991+0.13143979j]]

```

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[0.02269027+0.27040359j]
 [0.78460664-0.55745804j]]
```

———— Run time is 1716.8868968486786 seconds ————

4.106.2 Qtrits

$$h^{(166)}(\vec{r}) = 3.54106 > 3 \quad (300)$$

———— RESULTS ————

VIOLATION: 3.5410639704795424

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.26640303+0.15539103j]
 [0.41789794+0.85454336j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.61194619+0.48834035j]
 [-0.5537804 +0.20002677j]
 [-0.13741685-0.14655622j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.00733488-0.036654j]
 [0.99646466-0.00368685j]
 [-0.06925566+0.02917074j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.0221754 +0.27695282j]

```
[-0.50617586+0.68908119j]
[-0.3858201 -0.20712642j]]
```

———— Run time is 956.7535276412964 seconds ————

4.106.3 Qquarts

$$h^{(166)}(\vec{r}) = 3.2553582 > 3 \quad (301)$$

———— RESULTS ————

VIOLATION: 3.2553582013026627

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[0.24525202+0.3939615j]
 [0.45999403+0.7570015j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[0.752551 +0.00700945j]
 [0.60547816+0.00688696j]
 [0.25629149+0.03579512j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```
[[ -0.02284089+0.01560674j]
 [ 0.64473613-0.55440418j]
 [-0.31591396+0.10612458j]
 [ 0.39341098-0.10173392j]]
```

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.13659857+0.20680376j \\ -0.00106586+0.78857211j \\ -0.39798599+0.04314529j \\ -0.23341116+0.31935999j \end{bmatrix}$

———— Run time is 1084.699420928955 seconds ————

4.107 Equation 167

4.107.1 Qbits

$$h^{(167)}(\vec{r}) = 3.6368500 > 3 \quad (302)$$

———— RESULTS ————

VIOLATION: 3.6368500903572816

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.41283356+0.05213201j \\ -0.8151022 -0.40306216j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.13679407-0.87712343j \\ 0.42766415-0.17042666j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.50750594+0.59143459j \\ 0.11434045-0.6160918j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.94188755-0.25893432j \\ 0.12270672+0.17533944j \end{bmatrix}$

Run time is 2126.387679576874 seconds

4.107.2 Qtrits

$$h^{(167)}(\vec{r}) = 3.51313 > 3 \quad (303)$$

RESULTS

VIOLATION: 3.5131393658926484

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.36972845+0.01721746j \\ 0.82203128+0.43274589j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.47696738+0.50326538j \\ 0.30666176+0.64355298j \\ -0.04276052+0.09589449j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.55146805-0.35453623j \\ 0.14765555+0.30216517j \\ 0.23650529-0.63336115j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[ -0.29020673+0.36042614j ]
 [  0.00298708+0.06305277j ]
 [ -0.79488067-0.387367j   ]]

```

———— Run time is 2146.946563720703 seconds ————

4.107.3 Qquarts

$$h^{(167)}(\vec{r}) = 3.356772 > 3 \quad (304)$$

———— RESULTS ————

VIOLATION: 3.3567724172215856

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.07477141+0.2193131j]
 [0.76591127+0.59974239j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.56489569+0.48172897j]
 [0.59355082+0.06200536j]
 [0.04136821+0.3016148j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.57165379-0.69443612j]
 [0.1488937 +0.36334158j]
 [0.07615049-0.07280832j]
 [-0.15847875+0.02384388j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.38580834+0.74009809j \\ -0.20847666+0.0356139j \\ -0.16723129+0.46278841j \\ -0.08811814+0.09365713j \end{bmatrix}$

———— Run time is 1113.7075831890106 seconds ————

4.108 Equation 168

4.108.1 Qbits

$$h^{(168)}(\vec{r}) = 3.6809139 > 3 \quad (305)$$

———— RESULTS ————

VIOLATION: 3.6809139727562323

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.5333554-0.00157469j \\ 0.2573927+0.80577821j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.3034968 +0.67275942j \\ 0.67442011-0.02102295j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.7929377 -0.3790423j \\ 0.02116248-0.47658042j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.63200942+0.62880343j \\ -0.1148374 +0.43815831j \end{bmatrix}$

———— Run time is 1359.3715081214905 seconds ————

4.108.2 Qtrits

$$h^{(168)}(\vec{r}) = 3.4410118 > 3 \quad (306)$$

———— RESULTS ————

VIOLATION: 3.441011842539947

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.00641344+0.07263151j \\ 0.6305893 +0.77268406j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.6594639 +0.55102125j \\ 0.14013654+0.11420821j \\ 0.47671179-0.03933261j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.13550055-0.06670452j \\ -0.987153 -0.02860012j \\ 0.037641 -0.02200578j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.67826142+0.55184957j \\ -0.02783509-0.0323994j \\ -0.48318832+0.01131474j \end{bmatrix}$

Run time is 5547.373221158981 seconds

4.108.3 Qquarts

$$h^{(168)}(\vec{r}) = 3.13772 > 3 \quad (307)$$

RESULTS

VIOLATION: 3.137726885660108

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.50865237+0.10232477j \\ 0.15192239+0.84126215j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07320622+0.55962643j \\ 0.50317199+0.3979788j \\ 0.34337167+0.38985361j \\ 0. & +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.68059232-0.2695973j \\ 0.51622083-0.26672454j \end{bmatrix}$

```
[-0.28927314-0.04364842j]
[-0.15798297+0.12626444j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.22275216+0.84990691j]
 [-0.14733272+0.22549356j]
 [-0.25348746-0.29179687j]
 [-0.07301493+0.02744007j]]
```

———— Run time is 859.7663152217865 seconds ————

4.109 Equation 169

4.109.1 Qbits

$$h^{(169)}(\vec{r}) = 3.68393 > 3 \quad (308)$$

———— RESULTS ————

VIOLATION: 3.6839363743021885

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.56758423-0.10783272j]
 [-0.06132765+0.81391594j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.24030461-0.87941986j]
 [-0.39673128+0.1071387j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.61640978+0.26288628j]
```

```
[-0.15651326+0.72555729j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.10541974+0.84210513j]
 [0.50326024-0.16271064j]]
```

———— Run time is 2769.42861700058 seconds ————

4.109.2 Qtrits

$$h^{(169)}(\vec{r}) = 3.49400 > 3 \quad (309)$$

———— RESULTS ————

VIOLATION: 3.49400178381032

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.06221459+0.44748437j]
 [0.84067705+0.2985786j ]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.18166276-0.7740064j ]
 [-0.45919101-0.33048498j]
 [ 0.03251103+0.21628469j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.21564368+0.73923837j]
 [-0.38860484-0.25249945j]
 [ 0.42347205+0.11369332j]]
```

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.86922991-0.10930649j \\ 0.25072-0.38801915j \\ 0.0895887+0.10509971j \end{bmatrix}$

———— Run time is 5694.041831970215 seconds ————

4.109.3 Qquarts

$$h^{(169)}(\vec{r}) = 3.420665 > 3 \quad (310)$$

———— RESULTS ————

VIOLATION: 3.420665097643727

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.36558028+0.02355163j \\ 0.88087279+0.29976576j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.59995293+0.656751j \\ 0.12533535+0.27098558j \\ 0.34345929+0.04035079j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[ 0.77580358+0.27638392j]
 [-0.15475886-0.34641149j]
 [-0.21630047+0.34782759j]
 [ 0.05439842+0.08402618j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.18981974-0.39209762j]
 [ 0.21425605-0.82800963j]
 [ 0.24444514+0.07323547j]
 [-0.11590789+0.01306972j]]
```

———— Run time is 642.8654277324677 seconds ————

4.110 Equation 170

4.110.1 Qbits

$$h^{(170)}(\vec{r}) = 3.695529 > 3 \quad (311)$$

———— RESULTS ————

VIOLATION: 3.695529809742015

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.03556913-0.43062593j]
 [-0.44760148-0.78291063j]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.26440142-0.76663037j]
 [-0.3711923 -0.45231189j]]
```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```
Qobj data =
[[-0.53574672+0.56982464j]
 [-0.06562547+0.61965202j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.49683328+0.56043018j]
 [-0.60135197-0.27829932j]]
```

```
———— Run time is 975.989422082901 seconds ————
———— Run time is 9909.4690284729 seconds ————
```

4.110.2 Qtrits

$$h^{(170)}(\vec{r}) = 3.5214806 > 3 \quad (312)$$

```
———— RESULTS ————
```

```
VIOLATION: 3.5214806712829234
```

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.46364416+0.11740312j]
 [0.84078241+0.25364449j]
 [0.          +0.j          ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.69442006+0.41660347j]
 [0.51106801+0.24672067j]
 [0.10616634+0.10435241j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
```

```
[[ 0.0656263 -0.93453656j]
 [-0.05862178-0.33776022j]
 [ 0.03595553-0.05935757j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ 0.40316242-0.50702618j]
 [-0.17239242+0.6168564j ]
 [-0.23366785+0.33993071j]]
```

———— Run time is 610.2892072200775 seconds ————

———— Run time is 68494.77761864662 seconds ————

4.110.3 Qquarts

$$h^{(170)}(\vec{r}) = 3.293710 > 3 \quad (313)$$

———— RESULTS ————

VIOLATION: 3.2937103681591013

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.1069922 +0.55362673j]
 [0.02277089+0.82554927j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.60645533+0.64042141j]
 [0.34362801+0.24553766j]
 [0.15335647+0.14207459j]
 [0.          +0.j       ]]
```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.533283 -0.51086543j]
 [ 0.46719974-0.26791832j]
 [-0.22445401+0.02235874j]
 [-0.3116908 -0.128605j  ]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.75922589-0.23485478j]
 [-0.44437698+0.28152763j]
 [ 0.2823432 +0.09382508j]
 [-0.02772333+0.04900172j]]

```

———— Run time is 2076.6216270923615 seconds ————

4.111 Equation 171

4.111.1 Qbits

$$h^{(171)}(\vec{r}) = 3.6925103 > 3 \quad (314)$$

———— RESULTS ————

VIOLATION: 3.692510362750554

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.9666489 -0.19227468j]
 [-0.03420988+0.1656805j  ]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.18068028-0.17456579j]
 [-0.14549261-0.95692911j]]

```

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.52242091 - 0.63330791j \\ -0.04571231 + 0.56912905j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.87084813 - 0.02577188j \\ 0.42966541 + 0.2373752j \end{bmatrix}$

———— Run time is 7603.941436290741 seconds ————

4.111.2 Qtrits

$$h^{(171)}(\vec{r}) = 3.566647 > 3 \quad (315)$$

———— RESULTS ————

VIOLATION: 3.5666475133174513

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.61365354 + 0.78093739j \\ 0.11254485 + 0.02999622j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.23718561 + 0.12685527j \\ 0.27978061 + 0.719733j \\ -0.5251914 + 0.23565217j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24985052-0.83057197j \\ 0.38148473+0.07531603j \\ 0.23384509+0.20454409j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.72505237-0.16498071j \\ -0.3853835 +0.4054974j \\ -0.36094251-0.06206725j \end{bmatrix}$

———— Run time is 3549.408091545105 seconds ————

4.111.3 Qquarts

$$h^{(171)}(\vec{r}) = 3.32634473 > 3 \quad (316)$$

———— RESULTS ————

VIOLATION: 3.326344731505573

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.58016183+0.10039299j \\ 0.3823065 +0.71216237j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.05706315+0.13416927j \\ 0.1488679 +0.69116254j \end{bmatrix}$

```
[0.54890596+0.42139926j]
[0.          +0.j          ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.25450236+0.78576169j]
 [-0.25352882-0.12811534j]
 [-0.15385423-0.44553063j]
 [-0.03065041+0.11835793j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.44241356-0.30642206j]
 [-0.35739387-0.63883933j]
 [-0.38492003-0.0979409j ]
 [-0.12866358+0.01481674j]]
```

———— Run time is 1992.6853215694427 seconds ————

4.112 Equation 172

4.112.1 Qbits

$$h^{(172)}(\vec{r}) = 3.696123 > 3 \quad (317)$$

———— RESULTS ————

VIOLATION: 3.696123382268323

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.9481002 -0.29136869j]
 [ 0.00637314+0.12716004j]]
```

This is vector C:


```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.37395392-0.08671505j]
 [0.86134516+0.33275138j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.28468351+0.82238893j]
 [-0.13657107+0.47326535j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.78282125+0.38053647j]
 [-0.21555173-0.44262889j]]
```

———— Run time is 4771.291981458664 seconds ————

4.112.2 Qtrits

$$h^{(172)}(\vec{r}) = 3.608496 > 3 \quad (318)$$

———— RESULTS ————

VIOLATION: 3.608496809977707

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.8315562 +0.19087244j]
 [0.32166054+0.41062938j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.20842643-0.25645219j]
```

```
[ 0.04949312-0.08247605j]
[-0.93866812-0.02099982j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.08995999+0.7675384j ]
 [-0.12816322+0.10678406j]
 [ 0.52143086+0.32105018j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.43460254-0.72430377j]
 [0.1455446 -0.36522185j]
 [0.09415765+0.35081162j]]
```

———— Run time is 67031.99110293388 seconds ————

4.112.3 Qquarts

$$h^{(172)}(\vec{r}) = 3.3058621 > 3 \quad (319)$$

———— RESULTS ————

VIOLATION: 3.305862167416071

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.99557908+0.0700507j ]
 [0.02263768+0.05833296j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```

Qobj data =
[[0.03782703+0.39081169j]
 [0.67354681+0.40457769j]
 [0.38956446+0.27699541j]
 [0.          +0.j          ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 0.50745765-0.75116938j]
 [-0.01134311-0.31783288j]
 [-0.13688564-0.20732017j]
 [ 0.12373722+0.00739389j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.39745784+0.73339414j]
 [-0.41162349-0.23023744j]
 [ 0.01948701-0.01948888j]
 [ 0.28129339+0.0427971j ]]

```

———— Run time is 20945.25295162201 seconds ————

4.113 Equation 173

4.113.1 Qbits

$$h^{(173)}(\vec{r}) = 3.68948 > 3 \quad (320)$$

———— RESULTS ————

VIOLATION: 3.689489097033448

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[-0.92260518+0.35236367j]
 [ 0.15094085-0.04308583j]]

```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.08994354 - 0.83697199j \\ -0.53650755 - 0.05956253j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.0219457 + 0.24280806j \\ -0.96933377 - 0.03089777j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.79703507 + 0.13172518j \\ -0.26312136 + 0.52739997j \end{bmatrix}$

———— Run time is 3965.878562450409 seconds ————

4.113.2 Qtrits

$$h^{(173)}(\vec{r}) = 3.605292 > 3 \quad (321)$$

———— RESULTS ————

VIOLATION: 3.60529277257754

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.87928563 + 0.11152631j \\ 0.44581561 + 0.12516827j \\ 0. + 0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.67406332+0.56278716j \\ 0.09275369-0.11099529j \\ -0.07847656+0.44925213j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.08231741+0.0492624j \\ 0.25590711+0.24702869j \\ -0.90581108+0.20926472j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.5925911 +0.44056645j \\ -0.38578695+0.22580247j \\ 0.21978402-0.45454774j \end{bmatrix}$

———— Run time is 6715.292396306992 seconds ————

4.113.3 Qquarts

$$h^{(173)}(\vec{r}) = 3.463472 > 3 \quad (322)$$

———— RESULTS ————

VIOLATION: 3.463472726104264

This is vector A:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.64410969+0.6974736j \\ 0.30482198+0.07574193j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.56867589+0.64098071j]
 [0.09709218+0.48734676j]
 [0.0412364 +0.13083296j]
 [0.          +0.j          ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.21768119-0.01653726j]
 [ 0.22078643+0.41536483j]
 [ 0.30052968+0.74384372j]
 [ 0.10295579+0.27720997j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.395561 +0.71505882j]
 [ 0.27214352-0.01839774j]
 [ 0.46280553-0.17013865j]
 [ 0.1190408 +0.02269301j]]

```

———— Run time is 2909.167329788208 seconds ————

4.114 Equation 174

4.114.1 Qbits

$$h^{(174)}(\vec{r}) = 3.68186 > 3 \quad (323)$$

———— RESULTS ————

VIOLATION: 3.681866324873916

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

```
Qobj data =
[[ 0.90072729+0.3814494j ]
 [-0.19249547-0.07830835j]]
```

```
This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.84625181+0.32233099j]
 [-0.11451299-0.40846957j]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.44931039-0.6761863j ]
 [-0.50451462-0.29386606j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.13646091-0.30245951j]
 [-0.53130723-0.77949297j]]
```

———— Run time is 4095.394019126892 seconds ————

4.114.2 Qtrits

$$h^{(174)}(\vec{r}) = 3.585897 > 3 \quad (324)$$

———— RESULTS ————

VIOLATION: 3.585897985735666

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.74313018+0.65478973j]
 [0.13629322+0.02078731j]
 [0.          +0.j          ]]
```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.64707633-0.60831941j]
 [-0.33718979-0.23240639j]
 [ 0.20732486+0.02337613j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.17096742-0.82484558j]
 [ 0.4428222 -0.02650389j]
 [-0.2768602 -0.13020899j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.13541613-0.24634409j]
 [ 0.5509252 +0.24461557j]
 [-0.61343362-0.42581792j]]

```

```

Run time is 38362.940472364426 seconds

```

4.114.3 Qquarts

$$h^{(174)}(\vec{r}) = 3.36376 > 3 \quad (325)$$

```

RESULTS

```

```

VIOLATION: 3.363769480889375

```

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.22942106+0.57134713j]
 [0.05420412+0.78612362j]

```

```
[0.          +0.j          ]
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.28067634+0.49013198j]
 [0.23161487+0.71165045j]
 [0.11878067+0.32678858j]
 [0.          +0.j          ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.22941242-0.77738083j]
 [ 0.18868936+0.01569812j]
 [-0.36678855+0.17977078j]
 [ 0.15100409-0.34284876j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.24630916+0.40161473j]
 [ 0.07656409-0.12925001j]
 [ 0.48780985-0.2234764j ]
 [-0.15010025+0.66711285j]]
```

———— Run time is 1452.3810498714447 seconds ————

4.115 Equation 175

4.115.1 Qbits

$$h^{(175)}(\vec{r}) = 3.68643 > 3 \quad (326)$$

———— RESULTS ————

VIOLATION: 3.6864300306730824

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52237654+0.84833929j \\ -0.0261514 +0.08221497j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.84571403-0.10028536j \\ -0.35843486-0.38240696j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.25660678-0.05235843j \\ -0.55793653-0.78747595j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.15429433-0.8544956j \\ -0.34922616+0.35223801j \end{bmatrix}$

———— Run time is 2823.5144562721252 seconds ————

4.115.2 Qtrits

$$h^{(175)}(\vec{r}) = 3.53121674 > 3 \quad (327)$$

———— RESULTS ————

VIOLATION: 3.5312167479987604

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.48293368+0.64803172j \end{bmatrix}$

```
[0.41405765+0.41879137j]
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.8415727 -0.18638747j]
 [ 0.015902  +0.00930634j]
 [-0.21426925-0.45909075j]]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.42146574-0.21330774j]
 [-0.30814474+0.10192404j]
 [ 0.55284457+0.60488645j]]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.75493756+0.03019587j]
 [-0.60152025+0.01478954j]
 [ 0.10138399+0.23839763j]]]
```

———— Run time is 1859.1905167102814 seconds ————

4.115.3 Qquarts

$$h^{(175)}(\vec{r}) = 3.3527 > 3 \quad (328)$$

———— RESULTS ————

VIOLATION: 3.3527216930664867

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
```

```
[[0.52951671+0.16457503j]
 [0.48452894+0.67657876j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.44352659+0.41388909j]
 [0.4428541  +0.50735989j]
 [0.06529657+0.4173518j ]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.07921627+0.14056456j]
 [ -0.23054903+0.19322031j]
 [ -0.89863863-0.14320535j]
 [  0.17370051-0.1588975j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.59597893-0.72167488j]
 [-0.16842905+0.29193656j]
 [-0.05321906+0.0644539j ]
 [-0.02856457+0.05095766j]]
```

———— Run time is 2609.8099596500397 seconds ————

4.116 Equation 176

4.116.1 Qbits

$$h^{(176)}(\vec{r}) = 3.66389 > 3 \quad (329)$$

———— RESULTS ————

VIOLATION: 3.66389673197895

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.94327916 - 0.16537468j \\ 0.28219496 - 0.05693554j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.01351614 + 0.72355752j \\ -0.25424465 - 0.64159293j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.05680379 + 0.96795581j \\ 0.1335956 + 0.20490754j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.1474515 - 0.05389408j \\ -0.77028759 + 0.61806998j \end{bmatrix}$

———— Run time is 2365.059301137924 seconds ————

4.116.2 Qtrits

$$h^{(176)}(\vec{r}) = 3.59286 > 3 \quad (330)$$

RESULTS

VIOLATION: 3.5928687424360892

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[0.53550654+0.82050562j]
 [0.04062603+0.19583873j]
 [0.          +0.j          ]]

```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[-0.83004705-0.25668795j]
 [-0.22153283+0.0756691j ]
 [-0.43572759+0.02172682j ]]

```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[-0.23943503+0.75390555j]
 [-0.38418017-0.31608052j]
 [ 0.09990983-0.34178065j ]]

```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[-0.08866606+0.18921228j]
 [ 0.39282368+0.2548123j ]
 [ 0.17256457+0.84102245j ]]

```

———— Run time is 2932.9508221149445 seconds ————

4.116.3 Qquarts

$$h^{(176)}(\vec{r}) = 3.40367 > 3 \quad (331)$$

———— RESULTS ————

VIOLATION: 3.403670422988083

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.852769 + 0.4492168j] \\ [0.24877618 + 0.09539238j] \\ [0. + 0.j] \\ [0. + 0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.09247063 + 0.78701205j] \\ [0.19019343 + 0.32224441j] \\ [0.21950961 + 0.42879102j] \\ [0. + 0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.58116842 + 0.66001231j] \\ [0.05703707 + 0.05067405j] \\ [-0.34102171 + 0.00315545j] \\ [0.28566983 - 0.15130407j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.26784502 - 0.08378746j] \\ [0.18701543 - 0.32681859j] \\ [0.6799365 - 0.5089308j] \\ [0.15516057 + 0.18453872j] \end{bmatrix}$

———— Run time is 1308.0439162254333 seconds ————

4.117 Equation 177

4.117.1 Qbits

$$h^{(177)}(\vec{r}) = 3.693855 > 3 \quad (332)$$

———— RESULTS ————

VIOLATION: 3.6938556923940746

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.20010936-0.0209273j ]  
 [0.59462751-0.77841918j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.10678996+0.04161187j]  
 [ 0.50264658-0.856861j  ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.32848984+0.09962988j]  
 [ 0.38883303-0.85497204j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.39399193-0.65227675j]  
 [ 0.61893393+0.19033179j]]
```

———— Run time is 8004.560243844986 seconds ————

4.117.2 Qtrits

$$h^{(177)}(\vec{r}) = 3.52383 > 3 \quad (333)$$

———— RESULTS ————

VIOLATION: 3.523832705480422

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.35028952+0.09719806j \\ 0.49842184+0.78703587j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.19660045+0.04149745j \\ 0.79453529-0.37444198j \\ -0.42957647+0.05997633j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.02740159-0.046072j \\ 0.0191268 +0.97143943j \\ 0.22463157-0.05105675j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.63405732+0.13923411j \\ -0.59395404-0.37221873j \\ 0.16636358+0.24409046j \end{bmatrix}$

———— Run time is 3025.2892260551453 seconds ————

4.117.3 Qquarts

$$h^{(177)}(\vec{r}) = 3.23367 > 3 \quad (334)$$

———— RESULTS ————

VIOLATION: 3.2336751285640464

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.05652038+0.12780589j] \\ [0.7282297 +0.67093413j] \\ [0. +0.j] \\ [0. +0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.16563676+0.16326891j] \\ [0.77507599+0.56469543j] \\ [0.13601829+0.08822145j] \\ [0. +0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.38527592+0.16967911j] \\ [0.19415985+0.62171942j] \\ [0.12254854+0.42283362j] \\ [0.357679 +0.27712398j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.73637799-0.14636424j] \\ [-0.39419824-0.24189388j] \\ [-0.21912465-0.09396133j] \\ [-0.33224306-0.2349261j] \end{bmatrix}$

———— Run time is 2180.9614312648773 seconds ————

4.118 Equation 178

4.118.1 Qbits

$$h^{(178)}(\vec{r}) = 3.685595 > 3 \quad (335)$$

———— RESULTS ————

VIOLATION: 3.6855954916219233

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.21906166+0.24598066j]
 [ 0.03949113-0.94336947j]]
```

```
This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.07872402-0.33770491j]
 [-0.49044731-0.79951195j]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.23869156+0.81085838j]
 [0.39504104+0.35982997j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.22123568+0.80645933j]
 [0.46042726+0.29780003j]]
```

———— Run time is 947.2169425487518 seconds ————

4.118.2 Qtrits

$$h^{(178)}(\vec{r}) = 3.527846 > 3 \quad (336)$$

RESULTS

VIOLATION: 3.5278467327272445

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
```

[0.]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.12948686+0.10159214j]
 [0.93406204+0.31692316j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.16141208-0.28141535j]
 [0.84824386+0.22534481j]
 [-0.28184825+0.21216779j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.3071228 +0.42209442j]
 [-0.57212723-0.21835985j]
 [0.5834024 -0.11019503j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.94826117-0.03392425j]
 [0.15557725-0.19054292j]
 [0.14897443-0.13017536j]]

———— Run time is 373.44841384887695 seconds ————

———— Run time is 12907.888086795807 seconds ————

4.118.3 Qquarts

$$h^{(178)}(\vec{r}) = 3.2883849 > 3 \quad (337)$$

———— RESULTS ————

VIOLATION: 3.2883849482591714

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]

```
[0.]
[0.]
[0.]]
```

```
This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.00487029+0.16292896j]
 [0.66814691+0.72595464j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

```
This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.44657934+0.03763664j]
 [0.78125545+0.37809904j]
 [0.16296495+0.13883025j]
 [0.          +0.j        ]]
```

```
This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.51239416-0.70108908j]
 [ 0.0837135  -0.02327523j]
 [ 0.04557435+0.06192157j]
 [ 0.20024543+0.43859674j]]
```

```
This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.36532995-0.76823978j]
 [-0.03610334-0.36259825j]
 [ 0.0501501  -0.17151458j]
 [-0.24701055-0.22497608j]]
```

```
———— Run time is 9283.515700817108 seconds ————
———— Run time is 9769.985059261322 seconds ————
```

4.119 Equation 179

4.119.1 Qbits

$$h^{(179)}(\vec{r}) = 3.702805 > 3 \quad (338)$$

————RESULTS————

VIOLATION: 3.7028054022892083

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11770267-0.25206954j \\ 0.95779583+0.07234758j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.14048808-0.10667043j \\ -0.32871369+0.92781023j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.74243204-0.08190928j \\ -0.01407754+0.66474609j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.02958102+0.35471777j \\ 0.93059288+0.08542338j \end{bmatrix}$

———— Run time is 1651.4030947685242 seconds ————

4.119.2 Qtrits

$$h^{(179)}(\vec{r}) = 3.52208 > 3 \quad (339)$$

———— RESULTS ————

VIOLATION: 3.522085004898831

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.22903969+0.03956335j]
 [0.95720595+0.17243064j]
 [0.          +0.j       ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.10028379+0.06703768j]
 [-0.90882077+0.25897528j]
 [-0.15060272-0.26409193j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.65715378+0.29771557j]
 [ 0.25889787-0.4285846j ]
 [ 0.10528544+0.46660097j]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.31681785+0.08535227j]
 [ 0.09619964-0.59397696j]
 [ 0.08459171+0.7232722j ]]
```

———— Run time is 6373.341710567474 seconds ————

4.119.3 Qquarts

$$h^{(179)}(\vec{r}) = 3.25620 > 3 \quad (340)$$

———— RESULTS ————

VIOLATION: 3.256203594977228

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.19881592+0.02372734j]  
 [0.61042835+0.76634618j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.11293383+0.58723212j]  
 [0.5734237  +0.31281849j]  
 [0.27060679+0.37749993j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.88260878+0.19379188j]  
 [-0.02316272-0.39223012j]  
 [ 0.08429097-0.01072125j]  
 [ 0.13166184-0.06716184j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.23425441-0.18743075j]  
 [-0.74349887-0.47608275j]  
 [-0.05213982+0.33977731j]  
 [ 0.06741394-0.08852917j]]
```

———— Run time is 3087.712516307831 seconds ————

4.120 Equation 180

4.120.1 Qbits

$$h^{(180)}(\vec{r}) = 3.697803 > 3 \quad (341)$$

RESULTS

VIOLATION: 3.6978038970619407

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.23219485 - 0.04540986j \\ 0.14671607 + 0.96046754j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.56981429 - 0.57897654j \\ -0.38086994 - 0.44162872j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.06783479 - 0.47596267j \\ -0.87242332 - 0.08795183j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.7669755 - 0.50854022j \\ -0.18001737 - 0.34746105j \end{bmatrix}$

Run time is 3165.663953065872 seconds

4.120.2 Qtrits

$$h^{(180)}(\vec{r}) = 3.455040 > 3 \quad (342)$$

RESULTS

VIOLATION: 3.45504088298227

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.16047601+0.23877376j]
 [0.83345564+0.47179046j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.91914064 -0.14002919j]
 [  0.20147857 -0.18398318j]
 [  0.23152096 -0.08675792j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.3279268 -0.0586178j ]
 [-0.72321131+0.57854226j]
 [-0.15156608-0.09115887j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.6396335 -0.03340543j]
 [  0.53417516+0.02237279j]
 [-0.02212419+0.55083568j]]
```

Run time is 47991.2830286026 seconds

4.120.3 Qquarts

$$h^{(180)}(\vec{r}) = 3.1081554 > 3 \quad (343)$$

RESULTS

VIOLATION: 3.10815543005969

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.05171363+0.01132428j]  
 [0.60618157+0.79356245j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.53432405+0.70509126j]  
 [0.1131415  +0.27589421j]  
 [0.11372592+0.33984103j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.27036224-0.25748114j]  
 [-0.53215309-0.67481043j]  
 [-0.03278692-0.18627776j]  
 [ 0.14598197-0.25488542j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.1550008  +0.7889481j ]  
 [ 0.21325594+0.44487841j]  
 [-0.15186924-0.05156183j]  
 [-0.1915858  -0.21843247j]]
```

Run time is 1165.5612154006958 seconds

4.121 Equation 181

4.121.1 Qbits

$$h^{(181)}(\vec{r}) = 3.68152 > 3 \quad (344)$$

RESULTS

VIOLATION: 3.6815215038481304

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.22421184 - 0.24307521j \\ 0.79077106 - 0.51509671j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.82971006 - 0.30167916j \\ -0.22130773 - 0.4142388j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.24968941 - 0.81908529j \\ -0.4172131 - 0.30444658j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.22303881 + 0.37158911j \\ 0.81309954 - 0.38864426j \end{bmatrix}$

Run time is 970.1221170425415 seconds

4.121.2 Qtrits

$$h^{(181)}(\vec{r}) = 3.55773 > 3 \quad (345)$$

RESULTS

VIOLATION: 3.5577307684119206

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.21657562+0.07906363j]
 [0.59495862+0.76997934j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.63388176-0.58286189j]
 [-0.4751473  +0.02924028j]
 [ 0.10626722+0.14336408j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.65044955-0.42873663j]
 [-0.41500275+0.14991657j]
 [-0.34052861-0.28712067j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.14532767+0.53801261j]
 [0.2962249  -0.75891768j]
 [0.1376838  -0.08222065j]]
```

Run time is 1301.7853355407715 seconds

4.121.3 Qquarts

$$h^{(181)}(\vec{r}) = 3.137464 > 3 \quad (346)$$

RESULTS

VIOLATION: 3.1374645271260904

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.04655678+0.15291494j]  
 [0.38017787+0.91099631j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.85892302+0.46756788j]  
 [0.12444197+0.14292642j]  
 [0.00500418+0.08770815j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.30454604+0.49927604j]  
 [0.05219853+0.60652332j]  
 [0.15462089-0.30701459j]  
 [0.36161361+0.19608655j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.50104741+0.13018017j]  
 [ 0.47505942+0.63271467j]]
```

```
[-0.00969469-0.29174923j]
[ 0.143646 +0.01222877j]]
```

———— Run time is 7062.721639633179 seconds ————

4.122 Equation 182

4.122.1 Qbits

$$h^{(182)}(\vec{r}) = 3.6946 > 3 \quad (347)$$

———— RESULTS ————

VIOLATION: 3.694683196441998

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.10074232-0.30545051j]
[-0.91274217-0.25189819j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.03740407-0.71412688j]
[0.62616948+0.31070164j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.10605501+0.12905408j]
[-0.9857213 +0.02123423j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.27290939-0.06251777j]
[-0.23252641+0.93142013j]]

———— Run time is 4297.009658336639 seconds ————

4.122.2 Qtrits

$$h^{(182)}(\vec{r}) = 3.47288 > 3 \quad (348)$$

———— RESULTS ————

VIOLATION: 3.4728851754593544

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[0.12890659+0.11009103j]  
 [0.9194983 +0.35466312j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.19443856-0.74871838j]  
 [ 0.37618888+0.4792847j]  
 [ 0.02033783+0.17311532j]]
```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.25909421+0.3444211j]  
 [ -0.16526471-0.84560605j]  
 [ -0.07090344+0.25856331j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.05990622+0.26307595j]  
 [ 0.3251776  -0.77500392j]  
 [ 0.4305527  -0.18829528j]]
```

———— Run time is 1701.4459323883057 seconds ————

4.122.3 Qquarts

$$h^{(182)}(\vec{r}) = 3.19734 > 3 \quad (349)$$

———— RESULTS ————

VIOLATION: 3.1973463900208134

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.02566859+0.05266862j]  
 [0.72784251+0.68323673j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.41181097+0.84537822j]  
 [0.1526395  +0.15720869j]  
 [0.14384425+0.21689359j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.03800779-0.31151203j]  
 [0.06991428-0.81835429j]  
 [0.43906951-0.16794922j]  
 [0.05546254+0.05346819j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```

[[-0.00579942+0.03835128j]
 [ 0.85471366-0.23778589j]
 [-0.1930675 -0.31112822j]
 [-0.00365165+0.27808059j]]

```

———— Run time is 622.1068544387817 seconds ————

4.123 Equation 183

4.123.1 Qbits

$$h^{(183)}(\vec{r}) = 3.678241 > 3 \quad (350)$$

———— RESULTS ————

VIOLATION: 3.6782414446487897

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.86028819+0.38363551j \\ 0.069344 +0.32851094j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.07488231-0.22934673j \\ -0.4373739 +0.86631218j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.99643205-0.06809595j \\ -0.04286618-0.02546755j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.72216285+0.45366813j \end{bmatrix}$

$[-0.06912466-0.51757881j]$

Run time is 1631.751725435257 seconds

4.123.2 Qtrits

$$h^{(183)}(\vec{r}) = 3.509056 > 3 \quad (351)$$

RESULTS

VIOLATION: 3.509056386154266

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.45055084+0.75825028j \\ 0.44938803+0.14181273j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.09570842-0.1180056j \\ 0.76184068+0.62587411j \\ -0.00639419+0.06894969j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.32403928-0.87460801j \\ -0.05943633+0.23653185j \\ 0.19641641+0.17888536j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.50690005+0.52558524j \\ -0.44379612-0.44836584j \end{bmatrix}$

$[-0.26233086-0.00284558j]$

Run time is 3702.8362605571747 seconds

4.123.3 Qquarts

$$h^{(183)}(\vec{r}) = 3.270148 > 3 \quad (352)$$

RESULTS

VIOLATION: 3.2701486593652085

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.72980853+0.64099359j \\ 0.18620566+0.14776396j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.06221138+0.09683046j \\ 0.09298581+0.75725608j \\ 0.52284577+0.36235726j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.20204299+0.62578115j \\ 0.08737763+0.24989167j \\ -0.63342708+0.02120475j \\ -0.01467548+0.30919413j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.31437913 - 0.39025079j \\ 0.2364838 + 0.25083922j \\ 0.74983494 - 0.02454832j \\ -0.04079142 - 0.25594176j \end{bmatrix}$

———— Run time is 5419.712865591049 seconds ————

4.124 Equation 184

4.124.1 Qbits

$$h^{(184)}(\vec{r}) = 3.68593970 > 3 \quad (353)$$

———— RESULTS ————

VIOLATION: 3.6859397073465794

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.42515687 - 0.77573945j \\ 0.2642187 + 0.38426347j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07130595 - 0.55967701j \\ 0.22287207 + 0.79498751j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.21436864 - 0.02697536j \\ 0.93529675 + 0.28024705j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.49520988-0.75108157j \\ 0.31194385+0.30550727j \end{bmatrix}$

———— Run time is 1823.7842693328857 seconds ————

4.124.2 Qtrits

$$h^{(184)}(\vec{r}) = 3.5587 > 3 \quad (354)$$

———— RESULTS ————

VIOLATION: 3.5587665219836

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.64660066+0.53765433j \\ 0.42556322+0.33426239j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.13295921+0.42291318j \\ -0.3328655 +0.74238268j \\ 0.04391488-0.37363926j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.10204691+0.238039j \\ -0.70222742-0.37653106j \\ 0.53196481-0.12263081j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[ -0.41879406+0.63090302j ]
 [  0.17325167+0.4530405j  ]
 [  0.27733079-0.33822878j ]]

```

———— Run time is 1993.4428548812866 seconds ————

4.124.3 Qquarts

$$h^{(184)}(\vec{r}) = 3.42972 > 3 \quad (355)$$

———— RESULTS ————

VIOLATION: 3.429727745269532

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.72856881+0.63920359j]
 [0.14811816+0.19663995j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.34507054+0.26201816j]
 [0.8685627 +0.04042109j]
 [0.02200188+0.2361222j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.15727985-0.0844843j]
 [-0.7210819 -0.4240349j]
 [-0.06083342-0.47035717j]
 [-0.10380088+0.18069184j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.53215393 - 0.43923573j \\ 0.00949413 - 0.50588588j \\ 0.18125303 + 0.18894617j \\ 0.44606265 - 0.01866262j \end{bmatrix}$

———— Run time is 2684.8526747226715 seconds ————

4.125 Equation 185

4.125.1 Qbits

$$h^{(185)}(\vec{r}) = 3.689206 > 3 \quad (356)$$

———— RESULTS ————

VIOLATION: 3.6892066822952367

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.89705842 - 0.02571751j \\ -0.24744463 - 0.36523411j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.47739807 + 0.19648667j \\ -0.33423006 - 0.78852669j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.82451295 - 0.03579573j \\ 0.30944717 + 0.47237645j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.28565051-0.02675349j \\ 0.60419318+0.74339669j \end{bmatrix}$

———— Run time is 2568.2500755786896 seconds ————

4.125.2 Qtrits

$$h^{(185)}(\vec{r}) = 3.377 > 3 \quad (357)$$

———— RESULTS ————

VIOLATION: 3.377376921935765

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.19891219+0.96647297j \\ 0.11240428+0.11717171j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07413634+0.07546355j \\ 0.54225298-0.08649843j \\ -0.48856835+0.66976842j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.00924448-0.16028075j \\ -0.51874472-0.40992506j \\ 0.42873219+0.59437252j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.10678796-0.04679126j \\ -0.46949713+0.4301107j \\ -0.61464197-0.45077643j \end{bmatrix}$

———— Run time is 2337.1285202503204 seconds ————

4.125.3 Qquarts

$$h^{(185)}(\vec{r}) = 3.30004 > 3 \quad (358)$$

———— RESULTS ————

VIOLATION: 3.300043419750778

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.89886268+0.15418561j \\ 0.1765309 +0.37028304j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.03969766+0.20356467j \\ 0.07095432+0.89008512j \\ 0.29724167+0.26710834j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.17378058+0.61733689j \end{bmatrix}$

```

[-0.06329387+0.41750028j]
[ 0.24025199+0.57977154j]
[-0.02712387-0.12566268j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[ 0.02016844-0.11834383j]
 [-0.58602837+0.5702019j ]
 [ 0.15226976+0.30376829j]
 [-0.03599279+0.44751735j]]

```

———— Run time is 317.73368740081787 seconds ————

4.126 Equation 186

4.126.1 Qbits

$$h^{(186)}(\vec{r}) = 3.71316 > 3 \quad (359)$$

———— RESULTS ————

VIOLATION: 3.7131662840957533

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[ 0.60210151+0.6610454j ]
 [-0.44738151+0.01850765j]]

```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[0.13398796+0.24669819j]
 [0.88376318+0.37436596j]]

```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.37665559-0.69659545j ]
 [ -0.57364516-0.2093241j  ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.01169503-0.9993427j ]
 [-0.00087923-0.03430188j ]]
```

———— Run time is 1230.6215949058533 seconds ————

4.126.2 Qtrits

$$h^{(186)}(\vec{r}) = 3.531825 > 3 \quad (360)$$

———— RESULTS ————

VIOLATION: 3.531825379091448

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.47932086+0.62305488j ]
 [0.22012826+0.57757915j ]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.37687679-0.00776681j ]
 [ 0.37307558+0.33503194j ]
 [ 0.00726153-0.77872912j ]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ -0.74055169-0.15915615j ]
 [ 0.22232966+0.14896934j ]]
```

$[-0.11508338-0.58428246j]$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.06389672+0.63094042j \\ -0.15862109+0.59669885j \\ -0.40812728+0.22372605j \end{bmatrix}$

———— Run time is 2445.1898217201233 seconds ————

4.126.3 Qquarts

$$h^{(186)}(\vec{r}) = 3.2540622 > 3 \quad (361)$$

———— RESULTS ————

VIOLATION: 3.2540622617806485

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.61671896+0.75063247j \\ 0.21142134+0.10728292j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.19089033+0.07751414j \\ 0.04486935+0.30573638j \\ 0.83963869+0.39632225j \\ 0. & +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```

Qobj data =
[[ -0.05470791-1.51876287e-05j ]
 [ -0.26712178-5.09470866e-01j ]
 [ -0.50360082-5.51441743e-01j ]
 [ -0.21052701-2.53118623e-01j ]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ -0.16184344-0.02882718j ]
 [ -0.65229475+0.04950028j ]
 [ -0.49626669-0.05352487j ]
 [ -0.54387473-0.00957647j ]]

```

———— Run time is 1362.4987103939056 seconds ————

4.127 Equation 187

4.127.1 Qbits

$$h^{(187)}(\vec{r}) = 3.715930 > 3 \quad (362)$$

———— RESULTS ————

VIOLATION: 3.7159309210928755

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 1.]
 [ 0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.67110677+0.50158758j ]
 [ -0.24296746-0.48886851j ]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.84009017+0.52776164j ]
 [ 0.12382686-0.0195722j ]]

```

```

This is vector D:

```

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.11466858+0.23871757j \\ -0.73746953+0.62129198j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.87858649+0.08079632j \\ -0.44334844-0.15811358j \end{bmatrix}$

———— Run time is 919.3752746582031 seconds ————

4.127.2 Qtrits

$$h^{(187)}(\vec{r}) = 3.49557000 > 3 \quad (363)$$

———— RESULTS ————

VIOLATION: 3.4955700050965115

This is vector A:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.3056106 +0.76724714j \\ 0.38962984+0.40758138j \\ 0. +0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.69137053+0.15499964j \\ 0.10174673-0.44384688j \\ -0.10169008+0.52942287j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =

```

[[-0.01759396+0.14483062j]
 [-0.5402502 -0.69808829j]
 [-0.44617788+0.02103103j]]

```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```

[[-0.28352076+0.65902109j]
 [ 0.39616177-0.47600867j]
 [-0.30025296-0.10782827j]]

```

———— Run time is 1235.7513692378998 seconds ————

4.127.3 Qquarts

$$h^{(187)}(\vec{r}) = 3.49206 > 3 \quad (364)$$

———— RESULTS ————

VIOLATION: 3.4920674978907655

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.51184049+0.6050726j ]
 [0.57988765+0.18877707j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.38087116+0.5394247j ]
 [0.24774635+0.55308095j]
 [0.36165003+0.25669166j]
 [0.          +0.j       ]]

```

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.04996727+0.30550896j \\ -0.03198686-0.6066801j \\ -0.02784619+0.46772207j \\ -0.3794449 +0.4142051j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.36407624-0.72051366j \\ 0.39167523-0.05605978j \\ -0.27075066-0.28583556j \\ -0.00078725-0.19169733j \end{bmatrix}$

———— Run time is 4744.019374132156 seconds ————

4.128 Equation 188

4.128.1 Qbits

$$h^{(188)}(\vec{r}) = 3.714659 > 3 \quad (365)$$

———— RESULTS ————

VIOLATION: 3.7146590021144927

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.78142952-0.31940587j \\ -0.4873583 -0.2232256j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.08604156+0.98327697j \\ 0.13934771+0.07965838j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.16752844-0.81907324j \\ -0.03015422+0.54785397j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.26079996+0.06814259j \\ -0.95692265-0.10788426j \end{bmatrix}$

———— Run time is 5990.126056194305 seconds ————

4.128.2 Qtrits

$$h^{(188)}(\vec{r}) = 3.6010434 > 3 \quad (366)$$

———— RESULTS ————

VIOLATION: 3.601043441183575

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.72127401+0.58655092j \\ 0.30752203+0.20285961j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.23690314+0.93727075j \\ 0.24963025-0.01924465j \\ -0.01847926+0.04871698j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.65397185+0.55863571j \\ -0.29561327-0.40866774j \\ -0.07641231-0.00340565j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.05847334-0.21643794j \\ -0.21705386+0.94366101j \\ 0.02713903+0.10672615j \end{bmatrix}$

———— Run time is 3708.8288176059723 seconds ————

4.128.3 Qquarts

$$h^{(188)}(\vec{r}) = 3.3966040 > 3 \quad (367)$$

———— RESULTS ————

VIOLATION: 3.3966040631839074

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.79058683+0.48861934j \\ 0.23807075+0.28203886j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.38337636+0.49858401j \\ 0.35195241+0.08373924j \\ 0.06602997+0.68497725j \\ 0. & +0.j \end{bmatrix}$

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ -0.10573715-0.29371257j]
 [ -0.33694102+0.42811197j]
 [  0.0064921  -0.71067571j]
 [  0.083436   -0.30607155j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[  0.02983958+0.08268725j]
 [ -0.23666541-0.49538216j]
 [  0.22762951+0.61375981j]
 [  0.17240728+0.48230473j]]

```

———— Run time is 609.9433360099792 seconds ————

4.129 Equation 189

4.129.1 Qbits

$$h^{(189)}(\vec{r}) = 3.6898 > 3 \quad (368)$$

———— RESULTS ————

VIOLATION: 3.6898199540757526

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 1.]
 [ 0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.85400943+0.01796796j]
 [-0.37743241+0.35761686j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```

```
[[0.18502612-0.11592773j]
 [0.60815971-0.76319582j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.14039446+0.43475963j]
 [-0.86658631-0.20075266j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.61422913-0.67780093j]
 [0.10557327+0.39008044j]]
```

```
———— Run time is 2109.8309466838837 seconds ————
———— Run time is 10136.295022964478 seconds ————
```

4.129.2 Qtrits

$$h^{(189)}(\vec{r}) = 3.51140 > 3 \quad (369)$$

———— RESULTS ————

VIOLATION: 3.5114049923469954

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.65620508+0.34149245j]
 [0.15937859+0.65374022j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.03790159+0.22206014j]
```

```
[ 0.32243878-0.86667188j]
[-0.30137983+0.05775849j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.10183652+0.28181511j]
 [-0.24412492+0.88852663j]
 [ 0.24603274-0.02451332j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.42041088+0.78835691j]
 [-0.19860227+0.2590909j ]
 [-0.14987709+0.2696553j  ]]
```

———— Run time is 1442.175406217575 seconds ————

4.129.3 Qquarts

$$h^{(189)}(\vec{r}) = 3.1953 > 3 \quad (370)$$

———— RESULTS ————

VIOLATION: 3.1953495898611197

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.55482934+0.72335812j]
 [0.20000602+0.35904739j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.13554177+0.01796382j]
 [0.54012187+0.0964069j ]
 [0.41736599+0.71139682j]
 [0.          +0.j       ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.0862006 +0.29859809j]
 [ 0.54862887+0.34665055j]
 [-0.21060145+0.64193929j]
 [-0.02068484+0.15931574j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.1806557 +0.66886677j]
 [ 0.46938546-0.31762268j]
 [-0.28311043+0.1067128j ]
 [-0.24602227+0.21611986j]]

```

———— Run time is 696.9953067302704 seconds ————

4.130 Equation 190

4.130.1 Qbits

$$h^{(190)}(\vec{r}) = 3.70251 > 3 \quad (371)$$

———— RESULTS ————

VIOLATION: 3.7025137961830454

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

This is vector B:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.14932406-0.77919741j]
 [ 0.55142312-0.25784931j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.12370189-0.27724238j]
 [-0.95012048-0.07145328j]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.8342169 +0.22257684j]
 [0.06537503+0.50026774j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.22139555+0.39034168j]
 [-0.6794401 +0.58049852j]]

```

```

———— Run time is 3358.150754213333 seconds ————

```

4.130.2 Qtrits

$$h^{(190)}(\vec{r}) = 3.55835 > 3 \quad (372)$$

RESULTS

```

VIOLATION: 3.558353083649502

```

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.22767761+0.83367301j]
 [0.46013823+0.20353141j]
 [0.          +0.j          ]]

```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.10156468-0.05450104j \\ -0.64653973+0.06335262j \\ 0.68139237+0.31684618j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.54842312+0.3842579j \\ 0.0337976 +0.57096195j \\ -0.45518651-0.13131399j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.28386235+0.11817611j \\ -0.47787308+0.57712368j \\ 0.33514315-0.48135353j \end{bmatrix}$

———— Run time is 861.8320860862732 seconds ————

———— Run time is 10462.328284025192 seconds ————

4.130.3 Qquarts

$$h^{(190)}(\vec{r}) = 3.24831 > 3 \quad (373)$$

———— RESULTS ————

VIOLATION: 3.2483114343012147

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.9312296 +0.31357303j \\ 0.15049594+0.10878584j \\ 0. +0.j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.01284912+0.10195182j]
 [0.00598526+0.6563529j ]
 [0.68117124+0.30758983j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.21175386-0.03923433j]
 [-0.45092135-0.21249597j]
 [ 0.63481808+0.50718248j]
 [-0.13134545-0.166303j  ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.03112366-0.05566191j]
 [ 0.48658388-0.15628554j]
 [-0.50143674-0.64628357j]
 [ 0.25616535+0.00144493j ]]
```

———— Run time is 1201.4714181423187 seconds ————

4.131 Equation 191

4.131.1 Qbits

$$h^{(191)}(\vec{r}) = 3.709683 > 3 \quad (374)$$

———— RESULTS ————

VIOLATION: 3.7096835974793043

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.35203775-0.79499178j]
 [0.16752262-0.46475118j]]
```

```
This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.34010978+0.86987835j]
 [0.11482579+0.33830759j]]
```

```
This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.16587716-0.49515209j]
 [-0.25104178-0.81503816j]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.06112069+0.20616713j]
 [ 0.32593368-0.92061209j]]
```

```
———— Run time is 6182.510802030563 seconds ————
———— Run time is 10061.09905552864 seconds ————
```

4.131.2 Qtrits

$$h^{(191)}(\vec{r}) = 3.569714 > 3 \quad (375)$$

———— RESULTS ————

VIOLATION: 3.5697140273738293

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.59135862+0.74308636j]
```

```
[0.03711588+0.31103063j]
[0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.04999707+0.67979273j]
 [-0.24954559+0.50963246j]
 [ 0.05143422-0.45906254j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.39507403+0.17224428j]
 [ 0.73233063+0.41988867j]
 [-0.29005636+0.13229167j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.07724358+0.19582296j]
 [ 0.88120656-0.161077j   ]
 [ 0.1026321  +0.37773357j]]
```

———— Run time is 2253.3532383441925 seconds ————

4.131.3 Qquarts

$$h^{(191)}(\vec{r}) = 3.35312 > 3 \quad (376)$$

———— RESULTS ————

VIOLATION: 3.353126230402414

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
```

```
[[0.49379329+0.26545118j]
 [0.59008437+0.58095119j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.39654284+0.72120631j]
 [0.50670334+0.02994547j]
 [0.03731843+0.25214591j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.13049851+0.1585889j ]
 [ -0.50067616+0.54948062j]
 [ -0.62439528-0.03954373j]
 [ -0.0644029  +0.09814897j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.15557637-0.09731167j]
 [  0.3231258  +0.1237868j ]
 [  0.63825797+0.62543728j]
 [  0.19755204+0.09497969j]]
```

———— Run time is 1711.0543813705444 seconds ————

4.132 Equation 192

4.132.1 Qbits

$$h^{(192)}(\vec{r}) = 3.661453 > 3 \quad (377)$$

———— RESULTS ————

VIOLATION: 3.6614539985881676

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.53395675 - 0.69157041j \\ 0.19821456 + 0.44422016j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.87134333 - 0.25652889j \\ 0.19614048 - 0.36943558j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.07711329 + 0.10939541j \\ 0.95471011 + 0.26573444j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.18745107 - 0.37626202j \\ 0.88372948 - 0.20569685j \end{bmatrix}$

———— Run time is 2055.0025959014893 seconds ————

4.132.2 Qtrits

$$h^{(192)}(\vec{r}) = 3.538575 > 3 \quad (378)$$

———— RESULTS ————

VIOLATION: 3.5385754812163683

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```
Qobj data =
[[0.7301364 +0.45896233j]
 [0.39588682+0.31548067j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.26069712+0.71410553j]
 [-0.22957265+0.32862078j]
 [-0.50442522-0.08336837j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.15321072+0.02288106j]
 [-0.4003762  -0.8864482j ]
 [ 0.08839799+0.14865131j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.11751521-0.47736758j]
 [0.10362861-0.82963151j]
 [0.20395452+0.13298717j]]
```

———— Run time is 11337.273255348206 seconds ————

4.132.3 Qquarts

$$h^{(192)}(\vec{r}) = 3.33790 > 3 \quad (379)$$

———— RESULTS ————

VIOLATION: 3.337905317749941

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.68220664+0.13343693j]
 [0.04668182+0.71736287j]
 [0.          +0.j          ]
 [0.          +0.j          ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.71160047+0.55809855j]
 [0.18089801+0.38345335j]
 [0.04132861+0.02611833j]
 [0.          +0.j          ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.02282547+0.03431341j]
 [-0.47917654+0.38760974j]
 [-0.00304354-0.25707189j]
 [ 0.01022251-0.74313552j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.48458151-0.04255814j]
 [-0.43534541-0.62886121j]
 [ 0.23671675+0.08940528j]
 [ 0.29521412+0.16491821j]]

```

———— Run time is 1183.2784912586212 seconds ————

4.133 Equation 193

4.133.1 Qbits

$$h^{(193)}(\vec{r}) = 3.70016 > 3 \quad (380)$$

———— RESULTS ————

VIOLATION: 3.700167629381348

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```



```
[[1.]  
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[$-0.53633066+0.67421447j$]
 [$0.42488245-0.27795534j$]]

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[$-0.37469146-0.80175108j$]
 [$-0.18972404-0.42521324j$]]

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[$0.13358979+0.23649058j$]
 [$0.20490923+0.9403394j$]]

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
[[$0.34745215+0.92472502j$]
 [$0.11123713-0.10856767j$]]

———— Run time is 78585.41107153893 seconds ————
———— Run time is 81787.05294680595 seconds ————

4.133.2 Qtrits

$$h^{(193)}(\vec{r}) = 3.53680 > 3 \quad (381)$$

———— RESULTS ————

VIOLATION: 3.53680875031499

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.4565713 +0.6163803j ]
 [0.62877783+0.12750062j]
 [0.          +0.j       ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.68278438-0.41771869j]
 [ 0.06744239+0.49651129j]
 [-0.30133261-0.1320731j ]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.31481463+0.00383127j]
 [-0.29063307+0.84368127j]
 [-0.24899625-0.20642737j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.51611496+0.75455234j]
 [-0.05153773+0.01316951j]
 [ 0.38815058+0.10385412j]]

```

———— Run time is 3036.143495798111 seconds ————

4.133.3 Qquarts

$$h^{(193)}(\vec{r}) = 3.26008 > 3 \quad (382)$$

———— RESULTS ————

VIOLATION: 3.260086128052465

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.32343315+0.91629806j] \\ [0.21643774+0.09457042j] \\ [0. +0.j] \\ [0. +0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.12877584+0.22182488j] \\ [0.3022187 +0.13225166j] \\ [0.87883465+0.23029007j] \\ [0. +0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.12597344-0.08807446j] \\ [-0.02188741+0.03419187j] \\ [-0.901965 -0.34703788j] \\ [0.01318998+0.20143313j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.10886848-0.14701253j] \\ [0.43128325-0.71633188j] \\ [0.19552586-0.47300755j] \\ [0.04692906-0.05682881j] \end{bmatrix}$

Run time is 181.96424341201782 seconds

Run time is 9667.656501054764 seconds

4.134 Equation 194

4.134.1 Qbits

$$h^{(194)}(\vec{r}) = 3.702928 > 3 \quad (383)$$

RESULTS

VIOLATION: 3.7029289021281517

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.82614625+0.05721397j \\ -0.18710739+0.52839357j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.88431429-0.11598985j \\ 0.14217011-0.42932767j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.84851494+0.46996206j \\ -0.16530725-0.17841406j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24234231-0.29537184j \\ -0.81674575+0.43237953j \end{bmatrix}$

———— Run time is 3297.7194776535034 seconds ————

4.134.2 Qtrits

$$h^{(194)}(\vec{r}) = 3.47347 > 3 \quad (384)$$

———— RESULTS ————

VIOLATION: 3.47347117325833

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.896943 +0.27433375j]
 [0.00382816+0.34672698j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.63370969-0.2477926j]
 [-0.06913063+0.57687095j]
 [-0.03653875-0.44510295j]]

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.10598011-0.84043499j]
 [-0.42813657+0.11318726j]
 [0.05113963-0.28932628j]]

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.0278638 +0.15821475j]
 [0.36361282+0.64563485j]
 [-0.23847339-0.60684718j]]

———— Run time is 983.9729843139648 seconds ————

4.134.3 Qquarts

$$h^{(194)}(\vec{r}) = 3.2957 > 3 \quad (385)$$

———— RESULTS ————

VIOLATION: 3.2957360047861943

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.65587699+0.62517632j]  
 [0.10877346+0.40883772j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.24309856+0.50373001j]  
 [0.27549997+0.00836972j]  
 [0.51743824+0.58604313j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.27138032+0.35695408j]  
 [ -0.07434599+0.77582551j]  
 [ -0.27421648+0.32522049j]  
 [ -0.02423733+0.09976707j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.1096242 -0.10393887j]  
 [-0.0393368  +0.18814941j]  
 [-0.07828039 -0.94002358j]  
 [ 0.1920609  +0.11649946j]]
```

———— Run time is 1129.6423664093018 seconds ————

4.135 Equation 195

4.135.1 Qbits

$$h^{(195)}(\vec{r}) = 3.69331 > 3 \quad (386)$$

———— RESULTS ————

VIOLATION: 3.6933107697177467

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.30743006+0.60199514j \\ -0.64121581+0.36322294j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.15496398+0.12450226j \\ -0.28211779+0.93856002j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.06433779+1.76357418e-01j \\ -0.98222131+1.25479887e-05j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.05365366-0.3249898j \\ -0.92447612+0.19195523j \end{bmatrix}$

———— Run time is 1093.1090619564056 seconds ————

4.135.2 Qtrits

$$h^{(195)}(\vec{r}) = 3.482747 > 3 \quad (387)$$

———— RESULTS ————

VIOLATION: 3.482747341715462

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.61439354+0.17539891j \\ 0.54557131+0.54231701j \\ 0. +0.j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.08788084-0.25056089j \\ 0.55221944-0.71341169j \\ -0.19629632-0.27759934j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.36745047+0.10814656j \\ -0.89122874-0.18775369j \\ -0.0032349 -0.15405807j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.36240358+0.23980091j \\ -0.33837024-0.8301612j \\ -0.08514361-0.01573868j \end{bmatrix}$

———— Run time is 1341.4101126194 seconds ————

4.135.3 Qquarts

$$h^{(195)}(\vec{r}) = 3.5062826 > 3 \quad (388)$$

———— RESULTS ————

VIOLATION: 3.506282679142778

This is vector A:


```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.56686893+0.57348213j]
 [0.23844113+0.54122424j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.2734536 +0.21234074j]
 [0.6779236 +0.63877664j]
 [0.08801058+0.06908457j]
 [0.          +0.j       ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.13641608-0.04870337j]
 [-0.59308153-0.2717896j ]
 [-0.01426379-0.07275181j]
 [-0.57279764-0.46883892j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.11369252+0.04350745j]
 [-0.68232712-0.47677646j]
 [ 0.08304793-0.0717553j ]
 [-0.31699216-0.42398727j]]

```

———— Run time is 3728.222318172455 seconds ————

4.136 Equation 196

4.136.1 Qbits

$$h^{(196)}(\vec{r}) = 3.683105 > 3 \quad (389)$$

RESULTS

VIOLATION: 3.683105169391487

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.4423067 & -0.76711314j \\ -0.25356194 & +0.38936943j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.03726174 & -0.25862544j \\ 0.10139992 & +0.95991797j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.37166138 & -0.92569769j \\ -0.01535244 & -0.06867249j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.55051578 & +0.56390924j \\ 0.3621179 & +0.49780456j \end{bmatrix}$

Run time is 521.1353957653046 seconds

4.136.2 Qtrits

$$h^{(196)}(\vec{r}) = 3.52977 > 3 \quad (390)$$

RESULTS

VIOLATION: 3.52977229533249

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.61340127+0.50136753j \\ 0.3413007 +0.5058491j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.13328658+0.20884887j \\ -0.76280408+0.57873472j \\ -0.09823878-0.11028167j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.73580507-0.3112673j \\ -0.12504143-0.14650799j \\ -0.50612116-0.26161992j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.62169279-0.51732662j \\ -0.30895065+0.06589065j \\ -0.4481546 -0.212689j \end{bmatrix}$

———— Run time is 8023.070821762085 seconds ————

4.136.3 Qquarts

$$h^{(196)}(\vec{r}) = 3.313090 > 3 \quad (391)$$

———— RESULTS ————

VIOLATION: 3.3130901912227513

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.64788261+0.68397253j]  
 [0.15803952+0.29572489j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.5186136 +0.38261679j]  
 [0.46049027+0.57401612j]  
 [0.14767312+0.14591499j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.13758456+0.45714807j]  
 [  0.12444174-0.07237604j]  
 [  0.50929672-0.68934692j]  
 [-0.07791166-0.1034869j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.23890227-0.22472805j]  
 [-0.14119279+0.15427717j]  
 [-0.78474059+0.42478776j]  
 [-0.08902747-0.21094512j ]]
```

———— Run time is 914.7435777187347 seconds ————

4.137 Equation 197

4.137.1 Qbits

$$h^{(197)}(\vec{r}) = 3.708000 > 3 \quad (392)$$

————— RESULTS —————

VIOLATION: 3.708000630606344

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.36283653 - 0.66377972j \\ -0.53100381 + 0.38181289j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.09771846 + 0.159995j \\ 0.96205034 - 0.19827218j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.26534139 + 0.1387829j \\ 0.72663823 + 0.6183285j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.12684648 - 0.23670085j \\ 0.08178876 + 0.95978814j \end{bmatrix}$

————— Run time is 31771.101147651672 seconds —————

4.137.2 Qtrits

$$h^{(197)}(\vec{r}) = 3.49371 > 3 \quad (393)$$

RESULTS

VIOLATION: 3.4937119700505317

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.70799692+0.16005797j]
 [0.0192606 +0.68756879j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.32147727-0.26437774j]
 [ 0.21733235-0.82292733j]
 [ 0.05587479+0.31494768j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.18224195+0.22492728j]
 [ 0.05827729+0.90314995j]
 [-0.29601155-0.09745092j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.13600679+0.04411349j]
 [ 0.1516964 +0.95757318j]
 [-0.01037619+0.19872166j]]
```

Run time is 918.0562696456909 seconds

4.137.3 Qquarts

$$h^{(197)}(\vec{r}) = 3.463555 > 3 \quad (394)$$

RESULTS

VIOLATION: 3.463555120174564

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.57924219+0.42360141j]
 [0.52010334+0.4631769j ]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.21943054+0.0888439j ]
 [0.69583262+0.65576563j]
 [0.04273151+0.16709105j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.05415664+0.14734411j]
 [ 0.4861135  -0.57359113j]
 [ 0.02586186+0.35855197j]
 [ 0.52984419+0.00896897j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.24792915+0.22527834j]
 [ 0.51832348+0.69142342j]
 [-0.08503532-0.06042484j]
 [-0.18046527+0.31241854j]]
```

Run time is 3299.3908212184906 seconds

4.138 Equation 198

4.138.1 Qbits

$$h^{(198)}(\vec{r}) = 3.71375 > 3 \quad (395)$$

—————RESULTS—————

VIOLATION: 3.7137540745699043

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.82933654 - 0.16760911j \\ 0.51263338 - 0.14599695j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.16737269 - 0.17035139j \\ 0.26265026 - 0.93486984j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.15252828 - 0.86352897j \\ 0.23881495 + 0.41715737j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.45807296 - 0.88275426j \\ 0.06579832 - 0.08114597j \end{bmatrix}$

————— Run time is 1680.7743890285492 seconds —————

4.138.2 Qtrits

$$h^{(198)}(\vec{r}) = 3.58895 > 3 \quad (396)$$

RESULTS

VIOLATION: 3.588950726602402

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.46063208+0.70700955j]
 [0.36281579+0.3953736j ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.1702571 -0.21545867j]
 [ 0.37682276-0.86228418j]
 [-0.07644272-0.18225587j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.74249171-0.1740419j ]
 [-0.39240115+0.37355943j]
 [-0.14368326+0.32287039j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.85033587-0.00495214j]
 [ 0.12539558-0.06221481j]
 [-0.29324041+0.41390785j]]
```

Run time is 5377.345704317093 seconds

4.138.3 Qquarts

$$h^{(198)}(\vec{r}) = 3.419678 > 3 \quad (397)$$

RESULTS

VIOLATION: 3.4196789437049517

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.70031833+0.63202224j]
 [0.06747781+0.32488284j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.26233439+0.38355049j]
 [0.29249303+0.79625525j]
 [0.10682081+0.23040055j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.57971352-0.34396837j]
 [-0.34371512-0.01245434j]
 [-0.58712534+0.22317395j]
 [-0.1131033  -0.14144846j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.42829152+0.6863403j ]
 [-0.12476436-0.09774218j]
 [ 0.16345482-0.51092327j]
 [ 0.16194238-0.07998935j]]
```

Run time is 2988.774646997452 seconds

4.139 Equation 199

4.139.1 Qbits

$$h^{(199)}(\vec{r}) = 3.683149 > 3 \quad (398)$$

—————RESULTS—————

VIOLATION: 3.6831494146642196

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.75423785+0.15686139j \\ -0.62722848-0.11447357j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.46438608-0.17654512j \\ -0.84141714+0.21259018j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.85466659-0.10853468j \\ -0.48873584-0.13748645j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.18513426+0.7775197j \\ 0.39021399-0.45707927j \end{bmatrix}$

————— Run time is 2352.1149904727936 seconds —————

4.139.2 Qtrits

$$h^{(199)}(\vec{r}) = 3.482956 > 3 \quad (399)$$

RESULTS

VIOLATION: 3.4829567755872293

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.49774863+0.68444126j]  
 [0.47559949+0.23998246j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.20749302-0.02446356j]  
 [-0.63501745+0.35568017j]  
 [ 0.65037207-0.06007343j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.52859784+0.54405783j]  
 [-0.4674658  -0.21804677j]  
 [-0.24356938+0.31494555j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.00810428-0.468087j  ]  
 [ 0.10881272+0.57215232j]  
 [-0.3476296  -0.56637802j]]
```

Run time is 1522.1123096942902 seconds

4.139.3 Qquarts

$$h^{(199)}(\vec{r}) = 3.132271 > 3 \quad (400)$$

RESULTS

VIOLATION: 3.132271816801234

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.25443428+0.83074039j]  
 [0.48779773+0.08477602j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.08829415+0.12639784j]  
 [0.19551673+0.92793941j]  
 [0.27445877+0.04002215j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.67510619-0.14253649j]  
 [-0.37492037+0.45510739j]  
 [ 0.15602963+0.12511094j]  
 [ 0.24089841+0.27963713j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.44263661-0.48867574j]  
 [ 0.30658427-0.37209999j]  
 [-0.21382728-0.13369678j]  
 [-0.00725488+0.51881303j]]
```

Run time is 1945.8203856945038 seconds

4.140 Equation 200

4.140.1 Qbits

$$h^{(200)}(\vec{r}) = 3.7306949 > 3 \quad (401)$$

————— RESULTS —————

VIOLATION: 3.730694939665419

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.06347933+0.84323242j \\ 0.05125815-0.53132105j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.43426602+0.20123491j \\ -0.75760332-0.44379584j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.22866012+0.68869976j \\ -0.31882451+0.6097197j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25705768+0.78210419j \\ -0.06468898-0.56395897j \end{bmatrix}$

————— Run time is 5364.507329463959 seconds —————

4.140.2 Qtrits

$$h^{(200)}(\vec{r}) = 3.62899 > 3 \quad (402)$$

RESULTS

VIOLATION: 3.628998907776098

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.71801353+0.33086486j]
 [0.52835085+0.30956484j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.44725583+0.07543043j]
 [ -0.82062116+0.3404545j ]
 [ -0.00577956-0.07007651j ]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.56046128-0.46254183j]
 [  0.50370562+0.40819974j]
 [ -0.07574012+0.21413843j ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.61987474+0.55248949j]
 [ 0.30847939+0.40751404j]
 [-0.08984907+0.20300387j ]]
```

Run time is 4144.058349847794 seconds

Run time is 9425.443254470825 seconds

4.140.3 Qquarts

$$h^{(200)}(\vec{r}) = 3.3155 > 3 \quad (403)$$

RESULTS

VIOLATION: 3.3155512968722696

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.55038841+0.4845027j ]
 [0.40001245+0.54983613j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.32878444+0.14055787j]
 [0.58763597+0.52074399j]
 [0.2570297  +0.43541897j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.60095302 -0.49772011j]
 [ 0.2825753  +0.12584154j]
 [ 0.08734827 +0.33116817j]
 [-0.41988971 +0.04284662j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.05904148+0.68337812j]
 [ 0.01844324+0.3916982j ]
 [-0.41414269+0.39896148j]
 [-0.204639  +0.05638507j]]
```

Run time is 1736.0888385772705 seconds

4.141 Equation 201

4.141.1 Qbits

$$h^{(201)}(\vec{r}) = 3.684725 > 3 \quad (404)$$

—————RESULTS—————

VIOLATION: 3.684725242295751

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.55275859 - 0.57852487j \\ 0.28192802 + 0.52941808j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.09477049 + 0.41270861j \\ 0.42785917 - 0.7985153j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.67789022 - 0.49545952j \\ 0.38565585 + 0.38243207j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.21808619 + 0.75504524j \\ -0.17606152 + 0.59274568j \end{bmatrix}$

————— Run time is 4035.7144367694855 seconds —————

4.141.2 Qtrits

$$h^{(201)}(\vec{r}) = 3.549961 > 3 \quad (405)$$

RESULTS

VIOLATION: 3.5499613390500233

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.32195468+0.72786012j]  
 [0.59379766+0.11819126j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.25627112-0.33184714j]  
 [ 0.20654113-0.76423143j]  
 [-0.32189695+0.30639195j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.13526221+0.66406616j]  
 [0.10736049+0.42160615j]  
 [0.14833905-0.57396671j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.65022701+0.38407972j]  
 [ 0.1913995  -0.62007514j]  
 [-0.08847197-0.0270807j  ]]
```

Run time is 3058.095451593399 seconds

4.141.3 Qquarts

$$h^{(201)}(\vec{r}) = 3.56118 > 3 \quad (406)$$

RESULTS

VIOLATION: 3.561186612241229

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.55023097+0.66675785j]
 [0.36637874+0.34416053j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.28962065+0.34304382j]
 [0.50081261+0.52914289j]
 [0.38099429+0.34996957j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.64639351-0.06341091j]
 [ -0.47292908+0.03719477j]
 [ -0.50666338+0.21853062j]
 [  0.01564659-0.22000203j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.38117209-0.6916175j ]
 [  0.35602784+0.47307533j]
 [ -0.02423159+0.08558762j]
 [  0.00162863+0.13379807j]]
```

Run time is 8060.31075835228 seconds

4.142 Equation 202

4.142.1 Qbits

$$h^{(202)}(\vec{r}) = 3.703766 > 3 \quad (407)$$

————— RESULTS —————

VIOLATION: 3.70376643050202

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.67093716+0.37431407j \\ -0.63372654-0.09012756j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.36235623+0.92785308j \\ -0.08549006+0.02186492j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.16824809-0.18274045j \\ -0.00616573-0.96863847j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.20436688-0.89246292j \\ -0.34179769+0.21193973j \end{bmatrix}$

————— Run time is 2427.8717308044434 seconds —————

4.142.2 Qtrits

$$h^{(202)}(\vec{r}) = 3.52198 > 3 \quad (408)$$

RESULTS

VIOLATION: 3.5219868127059772

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.28568823+0.62841638j]  
 [0.68945424+0.21938082j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.36531437+0.66539366j]  
 [ 0.2342684  -0.121998j]  
 [-0.23844657+0.54513734j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.30178811-0.11050092j]  
 [-0.66318766+0.56480062j]  
 [ 0.02124775+0.37073496j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.86742173+0.26212591j]  
 [-0.24043187+0.09822128j]  
 [ 0.28675655+0.17083714j]]
```

Run time is 2354.1178698539734 seconds

4.142.3 Qquarts

$$h^{(202)}(\vec{r}) = 3.389455 > 3 \quad (409)$$

RESULTS

VIOLATION: 3.3894551078494004

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.15752895+0.63147703j]
 [0.52852943+0.54504865j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.600067  +0.05521575j]
 [0.68288396+0.08169019j]
 [0.29818422+0.27377581j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.02350331+0.18264929j]
 [  0.7294429  +0.15216302j]
 [-0.24106499-0.56189609j]
 [  0.11920347-0.15098773j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.76016651+0.25056736j]
 [-0.37547346+0.27597571j]
 [-0.28348524+0.16550534j]
 [ 0.183313  +0.0293327j ]]
```

Run time is 1008.605141878128 seconds

4.143 Equation 203

4.143.1 Qbits

$$h^{(203)}(\vec{r}) = 3.692430 > 3 \quad (410)$$

—————RESULTS—————

VIOLATION: 3.6924307820524938

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.70862957+0.43992639j \\ -0.48567319-0.26159216j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.28134334+0.95111684j \\ -0.03131435+0.12345892j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.79826842+0.25887393j \\ -0.09815994-0.53489854j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.13200095-0.22800393j \\ 0.49764262-0.82640292j \end{bmatrix}$

————— Run time is 2426.8108682632446 seconds —————

4.143.2 Qtrits

$$h^{(203)}(\vec{r}) = 3.59890 > 3 \quad (411)$$

RESULTS

VIOLATION: 3.5989094788731006

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.89267402+0.00635216j]
 [0.42555941+0.14829675j]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.89824798+0.30828622j]
 [ 0.0207085  -0.10122691j]
 [-0.06454421-0.28856279j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.64083027-0.49210985j]
 [ 0.06985615+0.48347052j]
 [ 0.00235579+0.32944695j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.14212734-0.24597319j]
 [0.66880041-0.56015184j]
 [0.25993586+0.30110842j]]
```

Run time is 499.1358118057251 seconds

Run time is 15187.833203315735 seconds

4.143.3 Qquarts

$$h^{(203)}(\vec{r}) = 3.3336544 > 3 \quad (412)$$

RESULTS

VIOLATION: 3.3336544154458787

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.72376655+0.57925051j]
 [0.24708521+0.28209878j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.50234431+0.5289422j ]
 [0.02317114+0.19167544j]
 [0.28473489+0.59120217j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.21801463-0.27176321j]
 [ -0.10183774+0.26161637j]
 [  0.09917987-0.88013494j]
 [  0.03639994+0.11832669j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.2531152 -0.18845905j]
 [ 0.8577304 -0.23619661j]
 [-0.22864163+0.234143j ]
 [ 0.0150144 -0.04000283j]]
```

Run time is 1873.714812040329 seconds

4.144 Equation 204

4.144.1 Qbits

$$h^{(204)}(\vec{r}) = 3.71635 > 3 \quad (413)$$

—————RESULTS—————

VIOLATION: 3.716357940364179

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.4825954 + 0.55385j & \\ 0.45684737 - 0.50163964j & \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.12833337 + 0.18113264j & \\ 0.67813435 + 0.70061067j & \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.23192854 + 0.04314658j & \\ -0.82962222 - 0.50603804j & \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.08603092 + 0.28061816j & \\ 0.45039481 - 0.84320617j & \end{bmatrix}$

————— Run time is 2435.1872029304504 seconds —————

4.144.2 Qtrits

$$h^{(204)}(\vec{r}) = 3.5674461 > 3 \quad (414)$$

RESULTS

VIOLATION: 3.567446190159761

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.63278705+0.43242087j]
 [0.19904375+0.61071624j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.04942041-0.31552134j]
 [-0.57527418+0.60029687j]
 [-0.12032412-0.43843961j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.29479936-0.27139231j]
 [ 0.0359917  -0.88375082j]
 [-0.22299998+0.08602112j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.03299951+0.01041995j]
 [ 0.82321704+0.2549091j ]
 [-0.12380526+0.49072371j]]
```

Run time is 4475.74499630928 seconds

4.144.3 Qquarts

$$h^{(204)}(\vec{r}) = 3.169683 > 3 \quad (415)$$

RESULTS

VIOLATION: 3.1696835597422566

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.46794976+0.59319772j]
 [0.05850499+0.65246965j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.25221673+0.12014817j]
 [0.09133172+0.05747915j]
 [0.89246939+0.33734878j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.2239716 -0.43870472j]
 [ 0.55553845-0.52240435j]
 [-0.36383958+0.0969503j ]
 [-0.17960371-0.04253853j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.03035774+0.22065946j]
 [-0.2677496  +0.41020034j]
 [-0.32295229+0.75011181j]
 [-0.20571465+0.03390023j]]
```

Run time is 1419.7264502048492 seconds

4.145 Equation 205

4.145.1 Qbits

$$h^{(205)}(\vec{r}) = 3.712958 > 3 \quad (416)$$

————— RESULTS —————

VIOLATION: 3.712958787088477

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.00776047+0.81902933j \\ 0.5077491 -0.26706101j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.85058354-0.21645416j \\ -0.10241562-0.46815199j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.15002587+0.28388531j \\ 0.60724177-0.72674535j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.64387089-0.75789376j \\ 0.10156405+0.02668459j \end{bmatrix}$

————— Run time is 1957.318295955658 seconds —————

4.145.2 Qtrits

$$h^{(205)}(\vec{r}) = 3.525021 > 3 \quad (417)$$

RESULTS

VIOLATION: 3.525021663185396

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.63598786+0.35852956j]  
 [0.45278026+0.51182617j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.88396099+0.14137042j]  
 [  0.32418308-0.00608923j]  
 [  0.21503267+0.21738576j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.26599769-0.11379511j]  
 [-0.72971107-0.58527687j]  
 [  0.08229609-0.18573096j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.06853727+0.92037418j]  
 [  0.10916381+0.22416223j]  
 [  0.13760471-0.25906275j]]
```

Run time is 3995.346578836441 seconds

4.145.3 Qquarts

$$h^{(205)}(\vec{r}) = 3.23435 > 3 \quad (418)$$

RESULTS

VIOLATION: 3.2343502167978144

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.46500806+0.79387941j]
 [0.04245023+0.38951375j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.07674009+0.26827353j]
 [0.01125887+0.30893913j]
 [0.87349659+0.25213852j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.42641017+0.0129227j ]
 [ 0.61804347+0.17342358j]
 [-0.26362398+0.38165909j]
 [ 0.34240565-0.2712029j ]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.25665242+0.32616995j]
 [-0.60199771+0.17456693j]
 [ 0.01920615+0.62286679j]
 [-0.03582227-0.21272681j]]
```

———— Run time is 3347.1703147888184 seconds ————

4.146 Equation 206

4.146.1 Qbits

$$h^{(206)}(\vec{r}) = 3.6807811 > 3 \quad (419)$$

———— RESULTS ————

VIOLATION: 3.6807811447504433

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.45804656 - 0.71253327j \\ -0.51089492 - 0.14654717j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.80195698 - 0.36430041j \\ 0.01792134 - 0.47310573j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.97940694 + 0.19683271j \\ 0.0411865 - 0.01796096j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.13809476 - 0.1223662j \\ -0.7986323 + 0.5728375j \end{bmatrix}$

———— Run time is 1834.9302372932434 seconds ————

4.146.2 Qtrits

$$h^{(206)}(\vec{r}) = 3.68093 > 3 \quad (420)$$

RESULTS

VIOLATION: 3.6809363748428896

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.79006863+0.42450146j]  
 [0.08897182+0.43321367j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.21894574 -0.77683777j]  
 [ -0.25100002 +0.48806353j]  
 [ -0.02206643 +0.21654536j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.46930601 +0.87063434j]  
 [  0.02464011 -0.02908004j]  
 [  0.14214933 -0.00940712j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.28631129 -0.07610579j]  
 [0.85212939 +0.42072753j]  
 [0.0947509  -0.01094807j]]
```

Run time is 470.0753993988037 seconds

4.146.3 Qquarts

$$h^{(206)}(\vec{r}) = 3.25267 > 3 \quad (421)$$

RESULTS

VIOLATION: 3.252677290769062

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.37077714+0.72007996j]  
 [0.58588251+0.02740143j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.62382072+0.24176279j]  
 [0.0700981  +0.57738722j]  
 [0.34926788+0.30351387j]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.07303875+0.82128943j]  
 [ 0.22705744+0.32027444j]  
 [-0.20546973+0.32513009j]  
 [-0.13120055-0.02961839j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.11343356-0.25202456j]  
 [-0.43452298-0.57855153j]]
```

```
[ -0.2069833 +0.52177649j ]  
[ -0.29100116+0.01760343j ]]
```

———— Run time is 248.22326374053955 seconds ————
———— Run time is 17863.74482536316 seconds ————

4.147 Equation 207

4.147.1 Qbits

$$h^{(207)}(\vec{r}) = 3.696291 > 3 \quad (422)$$

———— RESULTS ————

VIOLATION: 3.696291096049483

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 1.]  
 [ 0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.10937525+0.71389995j ]  
 [ 0.43914339+0.53435662j ]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.43027063+0.76069531j ]  
 [ -0.09748785-0.47613649j ]]
```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.26099865+0.31504302j ]  
 [ 0.10439113-0.90649329j ]]
```

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.84578552-0.02906379j ]  
 [ -0.34887269+0.40260401j ]]
```

———— Run time is 781.357063293457 seconds ————

4.147.2 Qtrits

$$h^{(207)}(\vec{r}) = 3.557064 > 3 \quad (423)$$

———— RESULTS ————

VIOLATION: 3.557064062870147

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.72375031+0.50838774j \\ 0.19415031+0.42430301j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.16318543+0.77179389j \\ 0.29840881-0.49132226j \\ -0.12410904-0.17848325j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.20190512+0.26363179j \\ 0.15653257-0.78808941j \\ -0.14758652+0.47155429j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.57267587-0.09844721j \\ -0.55780149-0.34794812j \\ 0.47283383+0.08104488j \end{bmatrix}$

———— Run time is 424.1983754634857 seconds ————

4.147.3 Qquarts

$$h^{(207)}(\vec{r}) = 3.2069877 > 3 \quad (424)$$

———— RESULTS ————

VIOLATION: 3.2069877079782247

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.60336287+0.67118269j \\ 0.42867665+0.04127205j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.04929785+0.01935049j \\ 0.31515681+0.56345882j \\ 0.58545997+0.48746512j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.0461193 -0.04969902j \\ -0.04807197+0.6909874j \\ 0.1278805 +0.65033646j \\ -0.24885957+0.12002708j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

```

Qobj data =
[[ -0.70205731+0.49027026j ]
 [ -0.01533297-0.50295386j ]
 [  0.03969932-0.0189162j  ]
 [  0.02207405-0.10550735j ]]

```

```

———— Run time is 7574.5396592617035 seconds ————
———— Run time is 18262.918429136276 seconds ————

```

4.148 Equation 208

4.148.1 Qbits

$$h^{(208)}(\vec{r}) = 3.661048 > 3 \quad (425)$$

———— RESULTS ————

VIOLATION: 3.6610482181809485

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[ 1.]
 [ 0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[ 0.46451849+0.67760027j ]
 [-0.15528632+0.54860423j ]]

```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[0.47656673+0.70132629j ]
 [0.06314883-0.52634382j ]]

```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[0.36238947+0.0243562j ]
 [0.54876792+0.75295048j ]]

```

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.14689193+0.69752823j \\ -0.52911778+0.46033847j \end{bmatrix}$

———— Run time is 1578.909616470337 seconds ————

4.148.2 Qtrits

$$h^{(208)}(\vec{r}) = 3.533872 > 3 \quad (426)$$

———— RESULTS ————

VIOLATION: 3.5338723040923004

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.00272582+0.90419106j \\ 0.42593062+0.03184643j \\ 0. \quad \quad \quad +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.30238817+0.52198318j \\ -0.58789358+0.51337266j \\ 0.16366594+0.01174976j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.09827552-0.50619177j \\ -0.66121169+0.44920285j \\ 0.174004 \quad +0.25465727j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[ 0.00153183+0.80406669j]
 [ 0.27159227-0.24554723j]
 [-0.30657713-0.35415968j]]

```

———— Run time is 1490.0211343765259 seconds ————

4.148.3 Qquarts

$$h^{(208)}(\vec{r}) = 3.159321 > 3 \quad (427)$$

———— RESULTS ————

VIOLATION: 3.1593210107910554

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.74463429+0.16889893j]
 [0.43046288+0.4813467j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.16194063+0.61080902j]
 [0.29922149+0.03117719j]
 [0.40612323+0.58757636j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.07329605-0.18309322j]
 [0.88064704+0.12168722j]
 [0.25549002-0.22861712j]
 [-0.22865114+0.03058265j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.59688729+0.32946956j \\ -0.50635908-0.28837764j \\ -0.42665507+0.0343516j \\ 0.07432364+0.08291926j \end{bmatrix}$

———— Run time is 926.590124130249 seconds ————

4.149 Equation 209

4.149.1 Qbits

$$h^{(209)}(\vec{r}) = 3.713006 > 3 \quad (428)$$

RESULTS

VIOLATION: 3.7130062512936757

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.80748291-0.15626261j \\ -0.43432797-0.36730446j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.48754409-0.62184907j \\ -0.59301102+0.15473339j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.46196684-0.02908813j \\ -0.69036269-0.55600349j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.47572138+0.60853053j \\ 0.0027048 +0.63511609j \end{bmatrix}$

———— Run time is 2.9392220973968506 seconds ————
———— Run time is 11370.95275425911 seconds ————

4.149.2 Qtrits

$$h^{(209)}(\vec{r}) = 3.528716 > 3 \quad (429)$$

———— RESULTS ————

VIOLATION: 3.5287162140000223

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.90813635+0.00791011j \\ 0.09605344+0.40743041j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.28092519+0.51240202j \\ -0.23982921-0.51512816j \\ -0.13146101-0.56424121j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.16642837+0.17100543j \\ -0.39645905-0.65645673j \\ -0.19852441-0.56172198j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.70888589+0.24228075j \\ 0.22350786-0.57217104j \\ 0.15535079+0.19316182j \end{bmatrix}$

———— Run time is 1112.1029663085938 seconds ————

4.149.3 Qquarts

$$h^{(209)}(\vec{r}) = 3.28815 > 3 \quad (430)$$

———— RESULTS ————

VIOLATION: 3.2881509910274604

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.57028729+0.68694901j \\ 0.32297238+0.31394634j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.53228098+0.3681244j \\ 0.26839273+0.316015j \\ 0.26089537+0.58411887j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[ 0.07455224-0.2414767j ]
 [ 0.28826436-0.62404558j ]
 [ 0.34568356-0.54029214j ]
 [-0.05443457+0.22186908j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.70509372+0.10979165j ]
 [ 0.51833339-0.19502454j ]
 [-0.13197623+0.17626437j ]
 [ 0.27895202+0.24038196j ]]
```

———— Run time is 1790.4036390781403 seconds ————

4.150 Equation 210

4.150.1 Qbits

$$h^{(210)}(\vec{r}) = 3.711009 > 3 \quad (431)$$

———— RESULTS ————

VIOLATION: 3.7110092945994313

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 1.]
 [ 0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.73882289+0.26597929j ]
 [ 0.17585409+0.59369277j ]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.24163104+0.77612314j ]
 [ 0.32831629-0.48109847j ]]
```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```
Qobj data =
[[-0.61186429+0.53466639j]
 [ 0.56530528+0.14207j   ]]
```

```
This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.51851124+0.11148687j]
 [ 0.57534433+0.62265213j ]]
```

```
———— Run time is 239.91182589530945 seconds ————
———— Run time is 63835.35575842857 seconds ————
```

4.150.2 Qtrits

$$h^{(210)}(\vec{r}) = 3.508869 > 3 \quad (432)$$

———— RESULTS ————

VIOLATION: 3.5088693770020587

```
This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.73381599+0.25406198j]
 [0.17363239+0.60565534j]
 [0.          +0.j        ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.03206189-0.82377051j]
 [-0.54250849+0.15482251j]
 [ 0.00758541-0.04506865j ]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
```

```
[[0.09080996+0.86236476j]
 [0.24483898-0.33175754j]
 [0.27784009+0.02960185j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.6218708 -0.16052054j]
 [0.07182627+0.73431974j]
 [-0.19378063+0.07466214j]]

———— Run time is 1015.4977827072144 seconds ————

4.150.3 Qquarts

$$h^{(210)}(\vec{r}) = 3.2449878 > 3 \quad (433)$$

———— RESULTS ————

VIOLATION: 3.2449878329807116

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.13805481+0.83055406j]
 [0.53926947+0.01758592j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.59108915+0.09971656j]
 [0.09278987+0.48926946j]
 [0.61631367+0.11328339j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.73279605+0.36453923j \\ -0.30370932+0.32890144j \\ -0.05270377-0.17055585j \\ 0.28082352+0.13775616j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.17899248+0.19559842j \\ -0.36619615-0.02913174j \\ -0.23659392+0.81064593j \\ -0.07520608+0.27563601j \end{bmatrix}$

———— Run time is 4684.618017196655 seconds ————
———— Run time is 9199.764572620392 seconds ————

4.151 Equation 211

4.151.1 Qbits

$$h^{(211)}(\vec{r}) = 3.667643 > 3 \quad (434)$$

———— RESULTS ————

VIOLATION: 3.6676438124309674

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.63119199-0.39714386j \\ -0.25147554-0.616955j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.439348 & -0.63980705j \\ -0.20438845+0.59652799j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.67515994-0.45327565j \\ 0.11883562-0.56971777j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.40878206+0.2033352j \\ -0.84039471-0.29204238j \end{bmatrix}$

———— Run time is 2154.2351479530334 seconds ————

4.151.2 Qtrits

$$h^{(211)}(\vec{r}) = 3.51195 > 3 \quad (435)$$

———— RESULTS ————

VIOLATION: 3.5119566147579757

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.65370992+0.46158309j \\ 0.2361062 +0.55123339j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.73072476-0.08286964j \\ 0.23722374+0.46824814j \\ -0.40104881-0.15100457j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.45458743+0.78454801j \\ -0.36660975-0.13974613j \\ 0.13400519-0.07710774j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.49852852+0.08720478j \\ -0.51276916-0.67435725j \\ 0.05779103+0.15111229j \end{bmatrix}$

———— Run time is 1343.7274160385132 seconds ————

4.151.3 Qquarts

$$h^{(211)}(\vec{r}) = 3.0801208 > 3 \quad (436)$$

———— RESULTS ————

VIOLATION: 3.0801208896424765

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.30598988+0.82823786j \\ 0.46511705+0.06370532j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.82789672+0.14257862j \\ 0.1252273 +0.25799233j \\ 0.14609748+0.43666001j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.44233107-0.19250062j]
 [-0.84713069+0.09390937j]
 [ 0.02951555-0.14984491j]
 [-0.11529651+0.06495694j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.07517257+0.19302879j]
 [ 0.81239706-0.46392011j]
 [ 0.08722973-0.0622566j ]
 [-0.21206042-0.15944777j]]
```

———— Run time is 2050.9930279254913 seconds ————

4.152 Equation 212

4.152.1 Qbits

$$h^{(212)}(\vec{r}) = 3.493 > 3$$

$$h^{(212)}(\vec{r}) = 3.6289 > 3$$

$$h^{(212)}(\vec{r}) = 3.639 > 3$$

(437)

———— RESULTS ————

VIOLATION: 3.4939862812642564

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.70663442-0.60293168j]
 [-0.21987591-0.2979862j ]]
```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59571469+0.68366173j \\ -0.08498823+0.41292571j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.47115568-6.97697888e-07j \\ 0.86049475-1.93806897e-01j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.42969799-0.01193881j \\ -0.88128841+0.19633604j \end{bmatrix}$

———— Run time is 121.8114550113678 seconds ————

———— RESULTS ————

VIOLATION: 3.628905103441502

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.56090511-0.66981532j \\ 0.43380645+0.22032898j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.16696452+0.77773235j \\ -0.60296447-0.06073789j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

```
Qobj data =  
[[ 0.24476332-0.73936363j]  
 [-0.62423279-0.0613658j ]]
```

```
This is vector E:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.25351505+0.13809062j]  
 [-0.64150788-0.7107241j ]]
```

```
———— Run time is 126.08963680267334 seconds ————
```

```
———— RESULTS ————
```

```
VIOLATION: 3.639230200758824
```

```
This is vector A:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[1.]  
 [0.]]
```

```
This is vector B:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.87691423+0.01524816j]  
 [0.34684746+0.33239399j ]]
```

```
This is vector C:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[ 0.53827163+0.71028015j]  
 [-0.1075401 +0.4406823j ]]
```

```
This is vector D:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[-0.51985193-0.36135309j]  
 [ 0.12527052+0.76386203j ]]
```

```
This is vector E:  
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket  
Qobj data =  
[[0.52120327-0.07077925j]
```

[0.82105376+0.22182917j]]

Run time is 913.2710959911346 seconds

4.152.2 Qtrits

$$h^{(212)}(\vec{r}) = 3.257 > 3$$

$$h^{(212)}(\vec{r}) = 3.2593 > 3 \quad (438)$$

RESULTS

VIOLATION: 3.2572673230466522

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[0.90948667+0.22634871j]
 [0.2936813 +0.18802008j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ 0.65805358-0.46799635j]
 [-0.25786579+0.00977247j]
 [-0.50695488+0.15604928j]]
```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ 0.22852076-0.52281475j]
 [-0.45028903+0.36310777j]
 [ 0.40680024-0.41755132j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

```
[[ -0.38165286+0.25441508j]
 [ -0.23244507+0.17813203j]
 [  0.70573839-0.45363603j]]
```

———— Run time is 404.3501863479614 seconds ————

———— RESULTS ————

VIOLATION: 3.2593245553539534

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.66742692+0.69082208j]
 [0.27772707+0.013185j ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.22036534+0.39696548j]
 [0.33490003+0.56673071j]
 [0.49391351-0.34141653j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.77538719-0.22834486j]
 [  0.38192244-0.26740392j]
 [  0.29858239-0.20028051j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.29224362-0.0737626j ]
 [ -0.77443472-0.12537421j]
 [ -0.40772489+0.35699486j]]
```

———— Run time is 579.4672610759735 seconds ————

4.152.3 Qquarts

$$\begin{aligned}h^{(212)}(\vec{r}) &= 3.175 > 3 \\h^{(212)}(\vec{r}) &= 3.228 > 3\end{aligned}\tag{439}$$

———— RESULTS ————

VIOLATION: 3.1752147638035115

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.23219123+0.05830947j \\ 0.94665344+0.2157186j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.41044027+0.07646794j \\ 0.62531779+0.43108316j \\ 0.42682072+0.25818692j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.33664541-0.55999214j \\ -0.01489316-0.65325401j \\ 0.12219927-0.34540177j \\ -0.08913414-0.06273847j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

$$\begin{bmatrix} [-0.18209185+0.4096179j] \\ [-0.56343259-0.57824409j] \\ [-0.20487614+0.02399719j] \\ [-0.29088026-0.141675j] \end{bmatrix}$$

Run time is 162.6853687763214 seconds

RESULTS

VIOLATION: 3.228596805199226

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

$$\begin{bmatrix} [1.] \\ [0.] \\ [0.] \\ [0.] \end{bmatrix}$$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

$$\begin{bmatrix} [0.1408429 +0.07815054j] \\ [0.23464125+0.95864449j] \\ [0. +0.j] \\ [0. +0.j] \end{bmatrix}$$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

$$\begin{bmatrix} [0.36625039+0.28763428j] \\ [0.13238313+0.66914026j] \\ [0.3207955 +0.46361992j] \\ [0. +0.j] \end{bmatrix}$$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

$$\begin{bmatrix} [0.19018562-0.674919j] \\ [0.4451195 -0.3703874j] \\ [0.06302331-0.38839032j] \\ [-0.0089326 +0.13452437j] \end{bmatrix}$$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.08971107+0.14287126j \\ 0.78364764-0.19413497j \\ 0.24803015+0.30622828j \\ 0.26415766-0.30769096j \end{bmatrix}$

———— Run time is 393.3038823604584 seconds ————

4.153 Equation 213

4.153.1 Qbits

$$\begin{aligned} h^{(213)}(\vec{r}) &= 5.5874 > 5 \\ h^{(213)}(\vec{r}) &= 5.5922 > 5 \end{aligned} \tag{440}$$

———— RESULTS ————

VIOLATION: 5.587486314261413

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.05463614+0.46207263j \\ 0.76503151-0.44523091j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.3031551-0.30708424j \\ 0.2991999+0.85104388j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.67248468+0.12507038j \\ 0.64391989+0.34276657j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.69405362+0.46740786j \\ 0.52664118+0.14989511j \end{bmatrix}$

Run time is 260.0310516357422 seconds

RESULTS

VIOLATION: 5.592242121172095

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11241921+0.28975184j \\ 0.9063233 -0.28632824j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.21061051+0.42333255j \\ 0.82538184+0.30850864j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59361028+0.29267914j \\ 0.22993009+0.71351098j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.81776281+0.15912127j \\ 0.12225248+0.53944299j \end{bmatrix}$

Run time is 1454.8225519657135 seconds

4.153.2 Qtrits

$$\begin{aligned}h^{(213)}(\vec{r}) &= 5.446 > 5 \\h^{(213)}(\vec{r}) &= 5.6153 > 5\end{aligned}\tag{441}$$

RESULTS

VIOLATION: 5.4460258138899595

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.00852272+0.41966467j \\ 0.63578296+0.64775687j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.5790344 -0.1513023j \\ -0.08148806 -0.28250655j \\ 0.07221599 -0.74172864j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.88344402 -0.11805497j \\ -0.30775309 +0.28988549j \\ -0.13695301 -0.08993328j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.60792021 +0.58290602j \\ -0.45134933 +0.16117427j \\ -0.23409121 -0.07849545j \end{bmatrix}$

Run time is 57.81311774253845 seconds

RESULTS

VIOLATION: 5.615372241856334

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.2845208 +0.0462435j ]  
 [0.63684232+0.71508133j ]  
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.4733713 +0.20829354j ]  
 [0.6146957 +0.0927569j ]  
 [0.15097764+0.56858115j ]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.81547876 -0.44412602j ]  
 [-0.20346825 -0.18929689j ]  
 [-0.02563848 -0.24465587j ]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.6951085 +0.1936372j ]  
 [-0.64116985 -0.0183162j ]  
 [-0.06278869 -0.25288758j ]]
```

Run time is 382.84469413757324 seconds

4.153.3 Qquarts

$$h^{(213)}(\vec{r}) = 5.098 > 5 \quad (442)$$

RESULTS

VIOLATION: 5.0985343819286335

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.30538434+0.12004199j]
 [0.73340561+0.59535413j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.37223301+0.35453748j]
 [0.58008332+0.13353375j]
 [0.46641101+0.40481923j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.78119254+0.31414284j]
 [0.16474647+0.18859308j]
 [0.11125475+0.44808588j]
 [0.10517903-0.06420703j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.47385353-0.6266455j ]
 [-0.09446883-0.60036232j]
 [ 0.02063392-0.10956393j]
 [ 0.02556323-0.01831637j]]
```

Run time is 123.6820867061615 seconds

4.154 Equation 214

4.154.1 Qbits

$$h^{(214)}(\vec{r}) = 5.572 > 5$$

$$h^{(214)}(\vec{r}) = 5.6092 > 5 \quad (443)$$

—————RESULTS—————

VIOLATION: 5.572415663538355

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.35475989+0.2043428j \\ 0.56473489-0.71656399j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.97357608-0.07801638j \\ 0.10410194+0.18768551j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.89555225+0.00850003j \\ -0.20868367+0.39289318j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.61981074-0.67875537j \\ 0.05708851+0.38970077j \end{bmatrix}$

————— Run time is 499.3430697917938 seconds —————

—————RESULTS—————

VIOLATION: 5.609232538008445

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.0021194 + 0.44362989j \\ 0.81578148 - 0.37106416j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.95984757 + 0.15782155j \\ -0.21619016 + 0.08394533j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52513044 - 0.75734636j \\ -0.32129152 - 0.21779868j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.32257849 - 0.78923006j \\ -0.47937745 + 0.20798146j \end{bmatrix}$

———— Run time is 2278.064916610718 seconds ————

4.154.2 Qtrits

$$h^{(214)}(\vec{r}) = 5.5620 > 5$$

$$h^{(214)}(\vec{r}) = 5.7247 > 5 \quad (444)$$

———— RESULTS ————

VIOLATION: 5.5620607089596055

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.38756367+0.28041385j \\ 0.57879555+0.66042273j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.04259404-0.38035716j \\ 0.41455718-0.09772033j \\ 0.67112937-0.47084248j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.32236162-0.5448451j \\ 0.27566214-0.54617764j \\ 0.33791273-0.33277944j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.50658496+0.50474589j \\ 0.33973703+0.50833321j \\ 0.24324486+0.23582049j \end{bmatrix}$

Run time is 369.2435727119446 seconds

RESULTS

VIOLATION: 5.7247665252636795

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket


```
Qobj data =
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.36759729+0.36161098j]
 [0.37819097+0.76881814j]
 [0.          +0.j          ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.30754318-0.33380416j]
 [-0.01513664-0.01280151j]
 [-0.75382522-0.47470677j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.19415648+0.81715489j]
 [-0.13795041+0.40199536j]
 [ 0.33013935-0.070275j   ]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.73449092-0.29037131j]
 [0.56497369-0.04528j   ]
 [0.14679715-0.18279125j]]
```

———— Run time is 3885.877368927002 seconds ————

4.154.3 Qquarts

$$h^{(214)}(\vec{r}) = 5.30003119 > 5 \quad (445)$$

———— RESULTS ————

VIOLATION: 5.300031192051518

```
This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[0.19505486+0.37545557j]
 [0.65588832+0.62513777j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[0.14653806+0.34689107j]
 [0.46248227+0.21567067j]
 [0.76977425+0.07236776j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[-0.68190351+0.22898236j]
 [-0.62562374+0.27495811j]
 [-0.05807803-0.06807977j]
 [ 0.08694401-0.00069416j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```
Qobj data =
[[0.55759365-0.01650319j]
 [0.49288073-0.37863426j]
 [0.28447548-0.41366158j]
 [0.22447232+0.00957208j]]
```

———— Run time is 201.72841429710388 seconds ————

4.155 Equation 215

4.155.1 Qbits

$$h^{(215)}(\vec{r}) = 5.62058 > 5$$

$$h^{(215)}(\vec{r}) = 5.622 \quad (446)$$

RESULTS

VIOLATION: 5.620581328324281

This is vector A:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.38354871+0.0214285j \\ 0.36028877+0.85007247j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.09952651+0.85206083j \\ -0.32993391+0.39399293j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.90492344+0.39553871j \\ -0.15018432+0.04590613j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.83359748-0.32613251j \\ -0.20784852-0.39440058j \end{bmatrix}$

Run time is 2042.932531118393 seconds

RESULTS

VIOLATION: 5.622278963031229

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.45498848-0.14241199j \\ -0.87225575+0.10896885j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.92080488-0.09040817j \\ 0.20453133-0.31954917j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.61970123-0.76391207j \\ 0.07547136+0.16344055j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.92365499-0.24763446j \\ 0.18507504-0.22646382j \end{bmatrix}$

———— Run time is 4125.159087181091 seconds ————

4.155.2 Qtrits

$$h^{(215)}(\vec{r}) = 5.5395 > 5$$

$$h^{(215)}(\vec{r}) = 5.73199 > 5 \quad (447)$$

———— RESULTS ————

VIOLATION: 5.539562343924726

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.19799027+0.50107969j]
 [0.58101842+0.61002999j]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.8124962  +0.22431895j]
 [ -0.10203712+0.37497439j]
 [  0.01011588+0.37203661j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.66452495-0.08820538j]
 [-0.16766428-0.09883569j]
 [-0.23526689-0.67631065j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.15247803+0.74628599j]
 [  0.40807451+0.42134159j]
 [  0.26317171-0.08059023j]]
```

———— Run time is 563.0397465229034 seconds ————

———— RESULTS ————

VIOLATION: 5.731994846564018

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.31623193+0.34407339j \\ 0.59837813+0.65081063j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.17093076+0.81800588j \\ -0.00221777+0.37997835j \\ -0.1638161 +0.36114384j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.45929256-0.19966899j \\ -0.0238273 +0.14601927j \\ -0.70794714-0.47550406j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.73339637+0.24807181j \\ 0.59412609-0.03171598j \\ 0.21511785+0.01796474j \end{bmatrix}$

———— Run time is 622.9771549701691 seconds ————

4.155.3 Qquarts

$$h^{(215)}(\vec{r}) = 5.0058 > 5$$

$$h^{(215)}(\vec{r}) = 5.3354 > 5 \quad (448)$$

RESULTS

VIOLATION: 5.005829925626025

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \end{bmatrix}$

```
[0.]  
[0.]  
[0.]]
```

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.1033076 +0.2060741j]
 [0.65754117+0.71728698j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.64328739+0.08932317j]
 [0.39424151+0.00788874j]
 [0.03195703+0.64937882j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.34109872-0.22526628j]
 [0.24413674+0.0910877j]
 [0.50705998+0.64021226j]
 [0.29836977-0.0948734j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.31046591-0.17682818j]
 [0.66829644-0.42836146j]
 [0.30608387+0.33481088j]
 [0.19066551+0.00948937j]]

———— Run time is 40.26920032501221 seconds ————

———— RESULTS ————

VIOLATION: 5.335404177442142

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.20359212+0.35523133j]
 [0.88327024+0.22846147j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.03739705+0.80033731j]
 [0.4561117  +0.36132722j]
 [0.05487768+0.12827644j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.29697647+0.25984907j]
 [ -0.07643962-0.0310098j ]
 [ -0.37848761+0.35361313j]
 [ -0.70633582-0.26509133j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.59834113+0.30440446j]
 [0.37659238+0.35738793j]
 [0.42746953+0.10930121j]
 [0.14364368+0.25390432j]]
```

———— Run time is 57.14497518539429 seconds ————

4.156 Equation 216

4.156.1 Qbits

$$h^{(216)}(\vec{r}) = 5.611 > 5$$

$$h^{(216)}(\vec{r}) = 5.6323 > 5 \quad (449)$$

RESULTS

VIOLATION: 5.611597079203815

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.03662831-0.50486718j \\ -0.34003875+0.79255356j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.40724173+0.82853805j \\ 0.15672756-0.35087796j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.87214658-0.34150155j \\ -0.34972868-0.02066143j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} -0.17015671-0.97234j \\ 0.14395873-0.06983911j \end{bmatrix}$

Run time is 1844.5052967071533 seconds

RESULTS

VIOLATION: 5.632330166360261

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.15333666-0.42544204j]
 [-0.56147244+0.69299036j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.15318648+0.88724841j]
 [0.42039326-0.11222153j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.58894054-0.6734251j]
 [-0.19864181+0.40023631j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.84540067-0.53300546j]
 [-0.03235708+0.01248643j]]

———— Run time is 2850.482661962509 seconds ————

4.156.2 Qtrits

$$h^{(216)}(\vec{r}) = 5.564537 > 5$$

$$h^{(216)}(\vec{r}) = 5.7077 > 5 \quad (450)$$

———— RESULTS ————

VIOLATION: 5.5645373197950025

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.37955157+0.22276013j]
 [0.01608292+0.89780837j]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.30125926-0.33951419j]
 [-0.02849302-0.82979297j]
 [-0.00072027+0.32342577j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.04023312-0.64383245j]
 [ 0.55264799-0.3723664j ]
 [-0.26546085-0.26327756j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.07258938-0.04351889j]
 [ 0.28128328-0.17438086j]
 [-0.92792679-0.14919717j]]

```

```

——— Run time is 85.06303191184998 seconds ———

```

```

——— RESULTS ——

```

```

VIOLATION: 5.7077602583673

```

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

```

Qobj data =
[[0.33204793+0.19245199j]
 [0.82932381+0.40611381j]
 [0.          +0.j      ]]

```

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[-0.60574172+0.4230368j]
 [-0.51920797+0.3935526j]
 [-0.07026294+0.157224j ]]

```

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[-0.1059362 -0.45974368j]
 [-0.64254189-0.48882225j]
 [ 0.08220492-0.34474388j]]

```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[ 0.32021785-0.22584268j]
 [-0.06220271-0.39233651j]
 [ 0.6820482 -0.47272481j]]

```

———— Run time is 272.9904432296753 seconds ————

4.156.3 Qquarts

$$h^{(216)}(\vec{r}) = 5.516047 > 5$$

$$h^{(216)}(\vec{r}) = 5.5290 > 5 \quad (451)$$

———— RESULTS ————

VIOLATION: 5.516047477393756

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.598725 +0.05340999j]
 [0.51383023+0.61209007j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.52413721+0.61874705j]
 [0.20868885+0.52895171j]
 [0.13797903+0.00728785j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.26491306-0.72128575j]
 [ 0.45240554-0.0106462j ]
 [-0.06695803-0.12871593j]
 [-0.35216445-0.24436213j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.27042376+0.21164711j]
 [ -0.27749269+0.01185723j]
 [ 0.11447036+0.56541967j]
 [ 0.35820212+0.58636344j]]
```

———— Run time is 541.5924081802368 seconds ————

———— RESULTS ————

VIOLATION: 5.529053631942424

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
```

[0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.02233521+0.64433071j]
 [0.4748431 +0.59905184j]
 [0.          +0.j        ]
 [0.          +0.j        ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.46214206+0.6107174j ]
 [0.58887124+0.16351815j]
 [0.06123766+0.19024037j]
 [0.          +0.j        ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.03183092 -0.8964822j ]
 [ -0.2249381  -0.15370599j]
 [ -0.04112266 -0.05693698j]
 [ -0.13812445 -0.31156463j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.06071966 -0.4720208j ]
 [-0.05773078 -0.01334426j]
 [-0.23792357 -0.43330491j]
 [-0.13190413 -0.7129089j ]]
```

———— Run time is 790.4824838638306 seconds ————

4.157 Equation 217

4.157.1 Qbits

$$h^{(217)}(\vec{r}) = 5.5967 > 5 \quad (452)$$

———— RESULTS ————

VIOLATION: 5.5967909905001845

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.0202272 +0.45114061j]
 [ 0.55600938+0.69779408j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.7707318 +0.03603881j]
 [-0.19960575+0.60401262j]]

```

```

This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.46373607-6.90874536e-04j]
 [0.22709916-8.56372788e-01j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.67803968+0.44923629j]
 [-0.0890875 +0.57490205j]]

```

```

———— Run time is 32.336942195892334 seconds —————

```

4.157.2 Qtrits

$$h^{(217)}(\vec{r}) = 5.6356 > 5 \quad (453)$$

RESULTS

VIOLATION: 5.635614038286891

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]

```

```
[0.]  
[0.]]
```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.16743638+0.40059133j]
 [0.56067442+0.7050786j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.40380131-0.78253143j]
 [-0.25203651-0.22393861j]
 [-0.01162341-0.33284088j]]

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.3691638 +0.22093776j]
 [-0.03702072-0.13657053j]
 [0.81161562-0.36900222j]]

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.49669986-0.71677021j]
 [0.11235031-0.17606754j]
 [-0.32413367-0.30140457j]]

———— Run time is 1983.6111268997192 seconds ————

4.157.3 Qquarts

$$h^{(217)}(\vec{r}) = 5.327 > 5 \quad (454)$$

———— RESULTS ————

VIOLATION: 5.327080173673902

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]


```
[0.]
[0.]
[0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.0252055 +0.46739233j]
 [0.35424449+0.8095801j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.55633468+0.65094193j]
 [0.34970047+0.17545239j]
 [0.22557719+0.25061386j]
 [0. +0.j]]

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[0.11565121-0.41427166j]
 [-0.27174541-0.38801633j]
 [0.01377397-0.72533129j]
 [-0.09339562-0.23576174j]]

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
[[-0.82417086-0.29298759j]
 [-0.3493877 -0.25105518j]
 [0.07292806-0.0345446j]
 [-0.03108066-0.20572399j]]

———— Run time is 1411.4980099201202 seconds ————

4.158 Equation 218

4.158.1 Qbits

$$h^{(218)}(\vec{r}) = 5.6435 > 5 \quad (455)$$

————RESULTS————

VIOLATION: 5.643594142567762

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.35441549 - 0.06324306j \\ 0.91365713 - 0.18873426j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.73561081 + 0.13805893j \\ -0.66262476 - 0.02729269j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.50225293 + 0.53637453j \\ -0.53516598 + 0.41670341j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.2364653 + 0.39936456j \\ 0.22824395 + 0.85586028j \end{bmatrix}$

———— Run time is 4395.29442191124 seconds ————

4.158.2 Qtrits

$$h^{(218)}(\vec{r}) = 5.706 > 5 \quad (456)$$

VIOLATION: 5.706082213332104

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \end{bmatrix}$

```
[0.]  
[0.]]
```

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.15213785+0.44294757j \\ 0.78241888+0.41045368j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.76397228+0.29119497j \\ 0.01773487+0.33993107j \\ 0.00813809-0.4643468j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.16252551-0.94540838j \\ -0.02160602-0.26553918j \\ 0.08950418-0.02827683j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.07959854-0.31995177j \\ -0.02700223-0.08513175j \\ 0.87479083+0.34359773j \end{bmatrix}$

———— Run time is 5632.34848690033 seconds ————

4.158.3 Qquarts

$$h^{(218)}(\vec{r}) = 5.4813 > 5 \quad (457)$$

———— RESULTS ————

VIOLATION: 5.481366073237535

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.0154207 +0.46109227j]
 [0.55370626+0.69322832j]
 [0.          +0.j          ]
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.1505625 +0.79915213j]
 [0.4192136 +0.23356481j]
 [0.12818039+0.3032557j ]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[ [ 0.30047254-0.7513093j ]
  [-0.05075782-0.4192995j ]
  [ 0.3135545 +0.19339052j]
  [ 0.17254172-0.03708366j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.10830782-0.12197376j]
 [0.11843563-0.41463059j]
 [0.68424978-0.24158823j]
 [0.22687902-0.4576129j ]]
```

———— Run time is 183.60138416290283 seconds ————

4.159 Equation 219

4.159.1 Qbits

$$h^{(219)}(\vec{r}) = 5.5904 > 5 \quad (458)$$

————RESULTS————

```
## VIOLATION: 5.590474774480411
```

——

```
## This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

——

```
## This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.95925838+0.23025192j]
 [ 0.14752654-0.07101645j]]
```

——

```
## This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.33634181+0.19824371j]
 [ 0.68190177+0.61853342j]]
```

——

```
## This is vector D:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.10168056-0.85895876j]
 [-0.31414523+0.39136133j]]
```

——

```
## This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.4830319 -0.83237667j]
 [-0.14253781+0.23132709j]]
```

— — — — Run time is 633.5456666946411 seconds — — — —

4.159.2 Qtrits

$$h^{(219)}(\vec{r}) = 5.65266 > 5 \quad (459)$$

———— RESULTS ————

```
## VIOLATION: 5.652666987635517
```

——

```
## This is vector A:
```

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
```

```
Qobj data =
```

```
[[1.]
```

```
[0.]
```

```
[0.]]
```

——

```
## This is vector B:
```

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
```

```
Qobj data =
```

```
[[0.23727712+0.5841955j ]
```

```
[0.58675838+0.50806475j]
```

```
[0. +0.j  ]]
```

——

```
## This is vector C:
```

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
```

```
Qobj data =
```

```
[[ -0.22508768+0.28685019j]
```

```
[ -0.1493957 +0.09601389j]
```

```
[ 0.23830681-0.88245375j]]
```

——

```
## This is vector D:
```

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
```

```
Qobj data =
```

```
[ [ 0.19011307+0.65397645j]
```

```
[ 0.08669035+0.25463744j]
```

```
[-0.48860868-0.47442379j]]
```

——

```
## This is vector E:
```

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
```

```
Qobj data =
```

```
[[ -0.04477913-0.7837641j ]
```

```
[ 0.00209124-0.3650122j ]
```

```
[-0.15411928+0.47614875j]]
```

— — — — Run time is 720.7020361423492 seconds — — — —

4.159.3 Qquarts

$$h^{(219)}(\vec{r}) = 5.3096 > 5 \quad (460)$$

RESULTS

VIOLATION: 5.309631938034566

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.05597814+0.26147651j]  
 [0.62150036+0.73636525j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.20896395+0.304811j   ]  
 [0.40818337+0.04416734j]  
 [0.60790657+0.5703591j  ]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.03211042+0.43858499j]  
 [ 0.25964431+0.70558214j]  
 [-0.0097106  +0.43924206j]  
 [-0.21739174+0.03261522j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ -0.4042191  -0.05560758j]  
 [-0.28237955+0.6366224j  ]]
```

```
[-0.54817696+0.08617623j]
[ 0.05013805+0.19506483j]]
```

———— Run time is 445.7308495044708 seconds ————

4.160 Equation 220

4.160.1 Qbits

$$h^{(220)}(\vec{r}) = 5.60990 > 5 \quad (461)$$

———— RESULTS ————

VIOLATION: 5.609907846971863

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
[0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.05012475-0.99732833j]
[0.01246886+0.05165506j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.45486243+0.78399053j]
[-0.34725759+0.24056432j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.23613586-0.42353117j]
[0.84442109+0.22762736j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.36632167-0.83462569j]
[0.29556353-0.28609543j]]

———— Run time is 1915.0236058235168 seconds ————

4.160.2 Qtrits

$$h^{(220)}(\vec{r}) = 5.7290 > 5 \quad (462)$$

———— RESULTS ————

VIOLATION: 5.729066301556491

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.55476561+0.11977328j]  
 [0.52190115+0.63679562j]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ -0.55203926+0.54547923j]  
 [-0.14249059-0.23105314j]  
 [-0.37616271+0.42722074j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.00059328+0.40372176j]  
 [-0.04827635-0.07407726j]  
 [ 0.01106291+0.91053169j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.26009879-0.71820179j]  
 [0.35057428-0.22139655j]  
 [0.12252719-0.47916923j]]
```

———— Run time is 1241.6947138309479 seconds ————

4.160.3 Qquarts

$$h^{(220)}(\vec{r}) = 5.340318 > 5 \quad (463)$$

———— RESULTS ————

VIOLATION: 5.34031875254357

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.48413732+0.16605441j]  
 [0.6497202  +0.5620504j]  
 [0.          +0.j]  
 [0.          +0.j]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.44183022+0.44761541j]  
 [0.41141149+0.54401063j]  
 [0.27243904+0.2549441j]  
 [0.          +0.j]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.0043102  -0.06409025j]  
 [0.25476421 -0.25755404j]  
 [0.50733817 -0.77763267j]  
 [0.03109502 -0.03954089j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```

[[-0.29320242+0.07531862j]
 [-0.3293831 -0.451673j ]
 [-0.75760583-0.08547607j]
 [-0.09300288-0.07704179j]]

```

———— Run time is 201.51643705368042 seconds ————

4.161 Equation 221

4.161.1 Qbits

$$h^{(221)}(\vec{r}) = 5.6443 > 5 \quad (464)$$

———— RESULTS ————

VIOLATION: 5.6443619277232155

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.45526701+0.87553172j]
 [-0.12845713-0.0983612j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.84247972+0.28450295j]
 [-0.3131571 +0.33349457j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.88361796+0.03215452j]
 [-0.12785826+0.44926345j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.04496938-0.37324788j]

[0.92605192+0.03303963j]]

Run time is 1319.9486179351807 seconds

4.161.2 Qtrits

$$h^{(221)}(\vec{r}) = 5.851503 > 5 \quad (465)$$

RESULTS

VIOLATION: 5.851503996532759

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[1.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[0.05456582+0.43887589j]
[0.88242393+0.16043233j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[0.54394874+0.38229336j]
[0.22740095-0.43845699j]
[0.00580094+0.56034113j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[-0.13852457-0.76732687j]
[-0.46396521+0.17749989j]
[0.13929747-0.3547488j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[0.0030124 +0.47025844j]
[0.22824592-0.10098955j]

$[-0.58346544+0.61328698j]$

Run time is 18000.94289278984 seconds

4.161.3 Qquarts

$$h^{(221)}(\vec{r}) = 5.5034 > 5 \quad (466)$$

RESULTS

VIOLATION: 5.50340973165152

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.02723511+0.24824516j \\ 0.53977828+0.80391044j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.63564932+0.52759111j \\ 0.16091998+0.20540028j \\ 0.46882228+0.17239118j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.12867926-0.70053326j \\ -0.11037599-0.2399842j \\ -0.1867962 -0.54373568j \\ -0.26219864+0.15372081j \end{bmatrix}$

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.42719214+0.10134409j]
 [ 0.20300038+0.02402359j]
 [ 0.75843414-0.14380047j]
 [-0.06249983-0.4069924j ]]

```

———— Run time is 696.3283092975616 seconds ————

4.162 Equation 222

4.162.1 Qbits

$$h^{(222)}(\vec{r}) = 5.60261 > 5 \quad (467)$$

———— RESULTS ————

VIOLATION: 5.602613940669166

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

This is vector B:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.9318515 +0.22246963j]
 [0.22014189+0.18356903j]]

```

This is vector C:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.73232595+0.60774098j]
 [ 0.25231856+0.1751712j ]]

```

This is vector D:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.4996931 +0.78575193j]
 [0.22242266-0.28884056j]]

```

This is vector E:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

```

Qobj data =
[[0.58523201-0.38134712j]
 [0.64723088+0.3052377j ]]

```

———— Run time is 3768.8034868240356 seconds ————

4.162.2 Qtrits

$$h^{(222)}(\vec{r}) = 5.73645 > 5 \quad (468)$$

———— RESULTS ————

VIOLATION: 5.736459240334109

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.73071712+0.67276175j]
 [0.05314823+0.10305043j]
 [0.                +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.2850112 +0.78801067j]
 [-0.51138823-0.14437176j]
 [-0.06056647+0.10852822j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.24772086+0.83728121j]
 [ 0.10175041-0.07294997j]
 [-0.28094747-0.37813783j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =

```

```

[[-0.78456437+0.16782919j]
 [-0.21243498+0.37898052j]
 [-0.30474974+0.27324871j]]

```

———— Run time is 47888.332485198975 seconds ————

4.162.3 Qquarts

$$h^{(222)}(\vec{r}) = 5.6563 > 5 \quad (469)$$

———— RESULTS ————

VIOLATION: 5.65632933961483

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```

[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```

[[0.80923816+0.43775097j]
 [0.38867238+0.04941118j]
 [0.          +0.j          ]
 [0.          +0.j          ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```

[[0.46333272+0.50813187j]
 [0.49302547+0.50792737j]
 [0.07649985+0.14215565j]
 [0.          +0.j          ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
 Qobj data =

```

[[-0.51755101-0.48873864j]
 [-0.11441788-0.13596212j]
 [ 0.49048818+0.41925204j]
 [-0.14934818-0.1517977j]]

```

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.8519673 + 0.22606602j \\ 0.40168503 - 0.1253564j \\ -0.11346725 + 0.10110436j \\ 0.14450851 + 0.04473432j \end{bmatrix}$

———— Run time is 2732.9821145534515 seconds ————

4.163 Equation 223

4.163.1 Qbits

$$h^{(223)}(\vec{r}) = 5.6254 > 5 \quad (470)$$

———— RESULTS ————

VIOLATION: 5.625403827781198

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.74951978 + 0.65055449j \\ -0.08596754 - 0.08722691j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.85278118 - 0.28792077j \\ 0.07014215 - 0.43005344j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.31734643 - 0.65555684j \\ 0.2413588 + 0.64131304j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.47358627+0.79319152j \\ 0.16630611+0.34482682j \end{bmatrix}$

———— Run time is 928.0904936790466 seconds ————

4.163.2 Qtrits

$$h^{(223)}(\vec{r}) = 5.7316 > 5 \quad (471)$$

———— RESULTS ————

VIOLATION: 5.731669847747473

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.74555844+0.51872438j \\ 0.34154604+0.24168975j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.43455074+0.58208268j \\ -0.26085482+0.56329863j \\ -0.26741395+0.12443714j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.17732385-0.90638253j \\ -0.29474658+0.04958707j \\ 0.15400588-0.18432235j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.52279498+0.07115214j \\ -0.53278806-0.12947465j \\ 0.47685876+0.44000193j \end{bmatrix}$

Run time is 2426.827532052994 seconds

4.163.3 Qquarts

$$h^{(223)}(\vec{r}) = 5.443051 > 5 \quad (472)$$

RESULTS

VIOLATION: 5.443051221771883

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.02549276+0.77892288j \\ 0.59131092+0.20731778j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.16952564+0.4195211j \\ 0.74886743+0.33819219j \\ 0.34650734+0.00440165j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.85554101+0.33511939j \\ 0.09516039-0.11086739j \\ 0.15105793-0.2851413j \end{bmatrix}$

```
[−0.11853089+0.12737292j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[−0.52149461+0.41924402j ]
 [ 0.37352312+0.24125779j ]
 [−0.51695385+0.08720954j ]
 [ 0.07433143−0.27236195j ]]
```

———— Run time is 633.9204394817352 seconds ————

4.164 Equation 224

4.164.1 Qbits

$$h^{(224)}(\vec{r}) = 5.635150 > 5 \quad (473)$$

———— RESULTS ————

VIOLATION: 5.635150320350052

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[−0.66580912−0.71039208j ]
 [−0.22195603−0.05269569j ]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[−0.75621893+0.27680501j ]
 [ 0.34876797−0.47945054j ]]
```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.41009953−0.73546514j ]
 [−0.0226472 −0.5388845j ]]
```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.35970131+0.78751388j]
[0.44230881+0.23409354j]]

———— Run time is 1418.4559059143066 seconds ————

4.164.2 Qtrits

$$h^{(224)}(\vec{r}) = 5.7301 > 5 \quad (474)$$

———— RESULTS ————

VIOLATION: 5.730111720365178

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]]

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.70214313+0.63699161j]
[0.29657559+0.1152373j]
[0. +0.j]]

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.24339809-0.83474296j]
[0.02147815-0.41456982j]
[-0.06609934+0.25935108j]]

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.18673585+0.60831419j]
[-0.37348686+0.02125144j]
[-0.60312927+0.3022823j]]

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.37492285-0.72405841j \\ 0.18966782+0.46043127j \\ -0.23368905+0.18052941j \end{bmatrix}$

———— Run time is 8770.73963713646 seconds ————

4.164.3 Qquarts

$$h^{(224)}(\vec{r}) = 5.3249 > 5 \quad (475)$$

———— RESULTS ————

VIOLATION: 5.324915119150838

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.71219699+0.16899997j \\ 0.26469992+0.62781241j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.49185191+0.52619237j \\ 0.27087168+0.52042953j \\ 0.08999023+0.3590079j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 4.52103938e-01+0.58985671j \end{bmatrix}$

```

[-3.15538867e-01+0.11403223j]
[ 2.89072288e-04-0.42588202j]
[-8.97320221e-02-0.38167467j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[-0.00163236-0.61649381j]
 [ 0.20570227+0.11148256j]
 [-0.0932503 +0.14305806j]
 [ 0.29524708-0.6699693j]]

```

———— Run time is 1210.1038420200348 seconds ————

4.165 Equation 225

4.165.1 Qbits

$$h^{(225)}(\vec{r}) = 5.6139 > 5$$

$$h^{(225)}(\vec{r}) = 5.62056 > 5 \quad (476)$$

———— RESULTS ————

VIOLATION: 5.613916315533667

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[ 0.55415792-0.72028064j]
 [-0.41288018+0.06028898j]]

```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[-0.38784928+0.09486421j]
 [ 0.72775837+0.55762127j]]

```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.9322906 +0.35114288j]
 [ 0.05008345-0.0708842j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.43545415-0.74714729j]
 [ 0.05438006+0.49919276j ]]
```

```
———— Run time is 216.6022765636444 seconds ————
———— RESULTS ————
```

VIOLATION: 5.620565506736072

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.57499486-0.74285865j]
 [0.23543548+0.24922292j ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.32315469-0.25735042j]
 [ 0.89553749-0.1653917j ]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.99355396+0.04357125j]
 [-0.0803138 -0.06709529j ]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.70245959-0.53383241j]
```


$[-0.0327108 + 0.46957798j]$

Run time is 6595.690616130829 seconds

4.165.2 Qtrits

$$\begin{aligned} h^{(225)}(\vec{r}) &= 5.63328 > 5 \\ h^{(225)}(\vec{r}) &= 5.7288 > 5 \end{aligned} \tag{477}$$

RESULTS

VIOLATION: 5.633286991033765

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.54833555+0.40108646j \\ 0.62564196+0.38344479j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.50929135+0.0804545j \\ 0.63179111+0.15037324j \\ -0.00275726-0.55890042j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.24727949+0.33210513j \\ -0.66073936+0.30749568j \\ -0.42780065-0.33825367j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[ -0.31507731 -0.68728615j]
 [ -0.00794711 -0.49011019j]
 [ -0.23687881 +0.36329234j]]
```

Run time is 2629.999030828476 seconds

RESULTS

VIOLATION: 5.728806528320138

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

This is vector B:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.14378864+0.76262323j]
 [0.35024005+0.52446405j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.4787376 -0.15758105j]
 [0.47179031-0.71754622j]
 [-0.09184723+0.0091615j]]

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.41221872-0.2848779j]
 [0.27639289-0.22316594j]
 [0.43598976+0.6577516j]]

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
[[0.37479498+0.66455424j]
 [0.37444649+0.29558053j]
 [-0.3922638 +0.19091222j]]

Run time is 1197.5072214603424 seconds

4.165.3 Qquarts

$$h^{(225)}(\vec{r}) = 5.68561 > 5 \quad (478)$$

$$h^{(225)}(\vec{r}) = 5.60903 > 5$$

RESULTS

VIOLATION: 5.609034520681993

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]  
 [0.]  
 [0.]  
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.68123998+0.27690741j]  
 [0.5299186 +0.42239869j]  
 [0.          +0.j          ]  
 [0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.30757348+0.11323892j]  
 [0.45946855+0.55370122j]  
 [0.46722203+0.3957053j ]  
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[ 0.63834011-0.18634294j]  
 [ 0.59129199-0.05800356j]  
 [-0.39459442+0.05985466j]  
 [-0.02496103-0.21188959j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```

[[-0.33817154+0.84201637j]
 [-0.20067061+0.32723444j]
 [-0.08707974+0.14543726j]
 [ 0.01757284-0.01592751j]]

```

Run time is 35777.26401948929 seconds

RESULTS

VIOLATION: 5.685619801715939

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.55183462+0.3908288j ]
 [0.71637261+0.17187695j]
 [0.          +0.j       ]
 [0.          +0.j       ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.1779321 +0.44564553j]
 [0.56262891+0.5623333j ]
 [0.14437242+0.34077384j]
 [0.          +0.j       ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[ 0.25054586+0.26675851j]
 [ 0.44439791+0.33932316j]
 [-0.09213198-0.67952661j]
 [-0.17010392-0.23293109j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.63799962+0.53115252j]
 [ 0.499928 -0.10539527j]
 [ 0.10941247-0.13631684j]
 [-0.10752485-0.08764904j]]
```

———— Run time is 73867.80518651009 seconds ————

4.166 Equation 226

4.166.1 Qbits

$$h^{(226)}(\vec{r}) = 5.5775774 > 5 \quad (479)$$

———— RESULTS ————

VIOLATION: 5.577577491691257

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
 Qobj data =
 [[1.]
 [0.]]

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
 Qobj data =
 [[0.25988855-0.91047228j]
 [-0.3036244 -0.10635033j]]

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
 Qobj data =
 [[0.30863177+0.3792428j]
 [0.78571405-0.37891261j]]

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
 Qobj data =
 [[-0.78563303-0.54973168j]
 [-0.25265005+0.12939774j]]

This is vector E:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
 Qobj data =
 [[-0.00563552-0.99628904j]]

[0.04904817+0.07050299j]]

Run time is 1412.2113609313965 seconds

4.166.2 Qtrits

$$h^{(226)}(\vec{r}) = 5.7966481 > 5 \quad (480)$$

RESULTS

VIOLATION: 5.796648100385448

This is vector A:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[1.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[0.68609151+0.14126897j]
[0.59802131+0.3894766j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[−0.36442947−0.17300264j]
[−0.57230057−0.42585218j]
[−0.53884184−0.19501972j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[[−0.43465387−0.46100744j]
[−0.30969899−0.57017924j]
[−0.13657868−0.39859325j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

Qobj data =

[0.23766933+0.17822658j]
[0.21723479+0.74563915j]

$[-0.47651096-0.28551216j]$

Run time is 1623.7673411369324 seconds

4.166.3 Qquarts

$$h^{(226)}(\vec{r}) = 5.6113435 > 5 \quad (481)$$

RESULTS

VIOLATION: 5.611343588654854

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.48910864+0.28567857j \\ 0.45745954+0.68548615j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.26035416+0.06611972j \\ 0.6717892 +0.56237439j \\ 0.31766288+0.24365654j \\ 0. +0.j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

$\begin{bmatrix} 0.16968152-0.58347899j \\ 0.20268724-0.66503658j \\ 0.26701285+0.23066819j \\ -0.06308158-0.13755626j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.31922341+0.19765884j \\ -0.26772467+0.53893884j \\ 0.15392682-0.65620068j \\ 0.0967966+0.18230042j \end{bmatrix}$

Run time is 5342.832208156586 seconds

4.167 Equation 227

4.167.1 Qbits

$$h^{(227)}(\vec{r}) = 5.612118 > 5 \quad (482)$$

RESULTS

VIOLATION: 5.612118746135562

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.06887581-0.94592013j \\ 0.30422976-0.08908136j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.00828478+0.98291992j \\ 0.06730028-0.17108616j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.40678933-0.1962828j \\ 0.59933542+0.66090284j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket

```
Qobj data =
[[-0.66358903+0.67413492j]
 [-0.20161167-0.25405597j]]
```

———— Run time is 1160.0355689525604 seconds ————

4.167.2 Qtrits

$$h^{(227)}(\vec{r}) = 5.7920689 > 5 \quad (483)$$

———— RESULTS ————

VIOLATION: 5.792068956439307

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.37054746+0.46463984j]
 [0.70613044+0.38494701j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.11464932-0.26215389j]
 [0.25705414-0.53718202j]
 [0.24628155-0.70910854j]]

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.03184292+0.30346255j]
 [0.50753038+0.7281718j]
 [-0.28166368-0.19935101j]]

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =

```
[[0.52324259+0.33870766j]
 [0.74126632-0.18748881j]
 [0.06477917+0.15056613j]]
```

```
——— Run time is 125.0473747253418 seconds ———
——— Run time is 15743.918859004974 seconds ———
```

4.167.3 Qquarts

$$h^{(227)}(\vec{r}) = 5.52730 > 5 \quad (484)$$

———RESULTS———

VIOLATION: 5.527308384376964

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.65892676+0.10278304j]
 [0.44323946+0.59899077j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.5688262 +0.34604103j]
 [0.35420168+0.36936669j]
 [0.37646915+0.39124515j]
 [0. +0.j]]

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.34805854-0.02854339j]
 [-0.33228421-0.72225736j]
 [0.1351385 +0.45240028j]
 [0.10907931-0.10557139j]]

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.63565635 - 0.51082397j \\ 0.01497907 - 0.39282765j \\ -0.37776317 - 0.03145894j \\ -0.0182792 + 0.19087465j \end{bmatrix}$

———— Run time is 2217.5890378952026 seconds ————

4.168 Equation 228

4.168.1 Qbits

$$h^{(228)}(\vec{r}) = 5.630608 > 5 \quad (485)$$

———— RESULTS ————

VIOLATION: 5.630608603595642

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -8.48099638e-05 + 0.86805763j \\ -3.04232059e-01 + 0.39232486j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.02009417 - 0.99656234j \\ -0.07285184 - 0.03394613j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.19439256 - 0.92401363j \\ 0.29160702 - 0.15289112j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.25478513+0.29440472j \\ -0.91518072-0.10418561j \end{bmatrix}$

———— Run time is 10706.746081352234 seconds ————

4.168.2 Qtrits

$$h^{(228)}(\vec{r}) = 5.710790 > 5 \quad (486)$$

———— RESULTS ————

VIOLATION: 5.710790690881776

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.73816572+0.55723014j \\ 0.30728931+0.2240072j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.4651831 +0.51922111j \\ 0.37712131+0.38644692j \\ -0.40334303-0.24447254j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.52772557-0.4587466j \\ 0.67284546-0.11787613j \\ 0.20267373+0.05800725j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.15083935+0.34723692j \\ -0.67639713+0.39926857j \\ -0.41614202+0.25801425j \end{bmatrix}$

Run time is 5212.245272874832 seconds

4.168.3 Qquarts

$$h^{(228)}(\vec{r}) = 5.50572 > 5 \quad (487)$$

RESULTS

VIOLATION: 5.505729069029652

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.87102363+0.34399721j \\ 0.3403419 +0.08456443j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.32214617+0.25127102j \\ 0.4529392 +0.49849916j \\ 0.41475747+0.45541809j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.58871099-0.5264858j \\ 0.37536104-0.06329267j \end{bmatrix}$

```
[0.07630787+0.44638092j]
[0.03202606+0.15882604j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.6222922 +0.00483615j]
 [ 0.52478423+0.04300187j]
 [-0.5325202 +0.15820632j]
 [-0.13550981+0.09225764j]]
```

———— Run time is 1623.174780845642 seconds ————

4.169 Equation 229

4.169.1 Qbits

$$h^{(229)}(\vec{r}) = 5.62921 > 5 \quad (488)$$

———— RESULTS ————

VIOLATION: 5.6292107598666705

This is vector A:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.40209129+0.82412349j]
 [-0.39295401-0.06877647j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.97334415+0.11134626j]
 [ 0.10650891+0.16987945j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.15208477-0.92563026j]
```

```
[0.28498397+0.19713698j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.60687918+0.40455142j]
 [ 0.10730687+0.67566341j]]
```

———— Run time is 1766.0616693496704 seconds ————

4.169.2 Qtrits

$$h^{(229)}(\vec{r}) = 5.8069041 > 5 \quad (489)$$

———— RESULTS ————

VIOLATION: 5.806904111997868

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.31252837+0.65626637j]
 [0.68632812+0.02437578j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.13719056-0.88537728j]
 [-0.20702338-0.01787289j]
 [-0.37687543+0.10987543j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.40457315+0.33350388j]
 [0.09006815+0.08316744j]
 [0.47944746-0.69296231j]]
```

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.46179153+0.83139741j \\ -0.29242415-0.01454276j \\ -0.06556188+0.07419695j \end{bmatrix}$

———— Run time is 824.8708395957947 seconds ————

4.169.3 Qquarts

$$h^{(229)}(\vec{r}) = 5.52023 > 5 \quad (490)$$

———— RESULTS ————

VIOLATION: 5.520237915438901

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25927243+0.77230532j \\ 0.5756206 +0.07059197j \\ 0. +0.j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.70387243+0.53435648j \\ 0.12161496+0.3426556j \\ 0.2759128 +0.10342057j \\ 0. +0.j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =

```
[[ 0.70076878-0.14524542j]
 [-0.24141314+0.37006321j]
 [-0.25618668-0.1964251j ]
 [-0.3213396  -0.29176399j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.67052091+0.2904949j ]
 [-0.00889714+0.27829701j]
 [ 0.48966458+0.22948795j]
 [-0.06597915+0.30281458j]]
```

———— Run time is 1082.4690308570862 seconds ————

4.170 Equation 230

4.170.1 Qbits

$$h^{(230)}(\vec{r}) = 5.63135 > 5 \quad (491)$$

———— RESULTS ————

VIOLATION: 5.631355561319367

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.10250766+0.94269576j]
 [-0.3174882  +0.00425711j]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.99170887+0.12462234j]
 [-0.03001022-0.00906473j]]
```

This is vector D:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

```

Qobj data =
[[ 0.20313478-0.71048346j]
 [-0.66712682+0.09429378j]]

```

```

This is vector E:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.88893496+0.01014376j]
 [-0.22719218-0.39758705j]]

```

———— Run time is 3683.3269152641296 seconds ————

4.170.2 Qtrits

$$h^{(230)}(\vec{r}) = 5.79848 > 5 \quad (492)$$

———— RESULTS ————

VIOLATION: 5.798487759009063

```

This is vector A:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.50466004+0.45531061j]
 [0.70642169+0.19743071j]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.89637027+0.28310308j]
 [ 0.26911767+0.09418577j]
 [ 0.09007532+0.16420759j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.53028907+0.73006109j]

```

```
[-0.33734907-0.17204482j]
[-0.05116351+0.19945624j]]
```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.52732689-0.02415396j]
[0.19875841+0.1794789j]
[0.3211621 +0.73924304j]]

———— Run time is 5819.3843767642975 seconds ————

4.170.3 Qquarts

$$h^{(230)}(\vec{r}) = 5.400200 > 5 \quad (493)$$

———— RESULTS ————

VIOLATION: 5.400200061440047

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
[0.]
[0.]
[0.]]

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.75780179+0.23324258j]
[0.36922996+0.48477169j]
[0. +0.j]
[0. +0.j]]

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.23262666+0.84825604j]
[0.23667109+0.23463676j]
[0.01797326+0.33905143j]
[0. +0.j]]

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.36024525-0.79831203j]
 [-0.26610015+0.11335183j]
 [ 0.36916334-0.10998961j]
 [ 0.02072374+0.02132104j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ -0.39549966+0.60329839j]
 [ 0.24231599-0.05998173j]
 [ 0.48752911+0.22600359j]
 [-0.07649028+0.35026163j]]

```

———— Run time is 1223.4381926059723 seconds ————

4.171 Equation 231

4.171.1 Qbits

$$h^{(231)}(\vec{r}) = 5.637749 > 5 \quad (494)$$

———— RESULTS ————

VIOLATION: 5.637749349493947

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.85922606-0.20552923j]
 [-0.25324001-0.39415456j]]

```

```

This is vector C:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.03071193+0.88650288j]
 [-0.23277149+0.39873156j]]

```

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.29855232+0.17529877j \\ -0.89629785-0.27710471j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.04982099-0.98618554j \\ 0.06402932-0.14441677j \end{bmatrix}$

———— Run time is 1156.9329907894135 seconds ————

4.171.2 Qtrits

$$h^{(231)}(\vec{r}) = 5.829168 > 5 \quad (495)$$

———— RESULTS ————

VIOLATION: 5.829168431513167

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.66838071+0.14027593j \\ 0.60088871+0.41535846j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.11109678+0.62540163j \\ -0.37670545+0.64277959j \\ -0.19624026-0.05429062j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[0.33617209-0.1920437j ]
 [0.79815185-0.22779393j]
 [0.39559119+0.0684011j ]]

```

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket

```

Qobj data =
[[-0.04319239+0.46849639j]
 [-0.3585876 +0.41986284j]
 [ 0.59988324-0.33751413j]]

```

———— Run time is 739.498532295227 seconds ————

4.171.3 Qquarts

$$h^{(231)}(\vec{r}) = 5.600095 > 5 \quad (496)$$

———— RESULTS ————

VIOLATION: 5.600095941440503

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.33824822+0.60857563j]
 [0.33829583+0.63307169j]
 [0.          +0.j        ]
 [0.          +0.j        ]]

```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```

[[0.50560595+0.39251504j]
 [0.70366783+0.25045813j]
 [0.02406504+0.17843136j]
 [0.          +0.j        ]]

```

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.04441876 - 0.35742271j \\ -0.01800893 - 0.81512559j \\ -0.20957613 + 0.28881697j \\ -0.12824689 + 0.24846987j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33507542 + 0.28413016j \\ -0.49225273 + 0.22729935j \\ -0.61408028 - 0.3283108j \\ -0.14583739 + 0.08285922j \end{bmatrix}$

———— Run time is 453.7631516456604 seconds ————

4.172 Equation 232

4.172.1 Qbits

$$h^{(232)}(\vec{r}) = 5.626392 > 5 \quad (497)$$

———— RESULTS ————

VIOLATION: 5.626392674492654

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25202646 - 0.88724184j \\ -0.1602281 + 0.35158432j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.32388372 + 0.84720901j \\ -0.14471696 - 0.39546584j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.00526094 - 0.98659271j \\ 0.15742018 - 0.04273219j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.33663109 + 0.21605255j \\ 0.88401346 - 0.24191115j \end{bmatrix}$

———— Run time is 3438.6023256778717 seconds ————

4.172.2 Qtrits

$$h^{(232)}(\vec{r}) = 5.855766 > 5 \quad (498)$$

———— RESULTS ————

VIOLATION: 5.855766614309361

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.41070604 + 0.37685741j \\ 0.51662411 + 0.64992197j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.12996067 + 0.74943439j \\ -0.44142134 + 0.44314667j \\ 0.11039063 - 0.13431474j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.487733 & -0.02669376j \\ 0.53858569 & +0.14714509j \\ -0.21707567 & -0.63447292j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.17781248 & -0.31101157j \\ 0.77700615 & -0.35813273j \\ 0.30499126 & +0.2159566j \end{bmatrix}$

———— Run time is 12638.818003416061 seconds ————

4.172.3 Qquarts

$$h^{(232)}(\vec{r}) = 5.48945 > 5 \quad (499)$$

———— RESULTS ————

VIOLATION: 5.489451383882958

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.32356004 & +0.65912864j \\ 0.64406424 & +0.21456838j \\ 0. & +0.j \\ 0. & +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.50520923 & +0.64226396j \\ 0.54616052 & +0.02074509j \\ 0.10474048 & +0.1502278j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.11523201+0.65673007j ]
 [ -0.03652763+0.31141029j ]
 [ -0.0494859  +0.02217045j ]
 [ -0.48998853-0.46269582j ]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.52759585+0.23724165j ]
 [ 0.61699524-0.49051443j ]
 [ 0.0621103  -0.05623715j ]
 [ 0.08871275-0.17082511j ]]
```

———— Run time is 1467.636412858963 seconds ————

4.173 Equation 233

4.173.1 Qbits

$$h^{(233)}(\vec{r}) = 5.65314 > 5 \quad (500)$$

———— RESULTS ————

VIOLATION: 5.65314770225384

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 1.]
 [ 0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ 0.93965339-0.09163908j ]
 [ 0.27755155-0.1778171j  ]]
```

This is vector C:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.7569342  -0.52665002j]
 [ -0.36921547 -0.11563008j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.05793721-0.99116545j]
 [-0.06037037+0.10290652j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ -0.08886972-0.7059854j ]
 [ 0.2868271  +0.64141797j]]
```

———— Run time is 3187.8736402988434 seconds ————

4.173.2 Qtrits

$$h^{(233)}(\vec{r}) = 5.701540 > 5 \quad (501)$$

———— RESULTS ————

VIOLATION: 5.701540267787344

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.16726003+0.70792446j]
 [0.65348727+0.20933568j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.52384399+0.58360329j]
 [-0.09065989-0.01786081j]
 [-0.60864561+0.07750467j]]
```

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.4883905 + 0.83728064j \\ 0.14347421 + 0.05861257j \\ 0.13922488 - 0.1305067j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.45722831 - 0.77938158j \\ 0.11087106 + 0.0222541j \\ -0.41114019 - 0.04102109j \end{bmatrix}$

———— Run time is 1701.6702888011932 seconds ————

4.173.3 Qquarts

$$h^{(233)}(\vec{r}) = 5.375923 > 5 \quad (502)$$

———— RESULTS ————

VIOLATION: 5.375923916112791

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.02746836 + 0.62249447j \\ 0.60046039 + 0.50119202j \\ 0. + 0.j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.38930145 + 0.51419213j \end{bmatrix}$

```
[0.083718 +0.57517612j]
[0.13647729+0.47706238j]
[0. +0.j ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.64915235-0.14646539j]
 [ 0.72788926-0.0412195j ]
 [ 0.12348192-0.04537659j]
 [-0.0198249 -0.08903619j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.82507066+0.31140035j]
 [ 0.11994269-0.25376004j]
 [ 0.2979048 +0.23192368j]
 [ 0.00410288+0.03090507j]]
```

———— Run time is 2141.21066737175 seconds ————

4.174 Equation 234

4.174.1 Qbits

$$h^{(234)}(\vec{r}) = 5.61351 > 5 \quad (503)$$

———— RESULTS ————

VIOLATION: 5.613510541527115

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[ -0.87566578+0.0431348j ]
 [ 0.34082936+0.33938796j]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.21642962-0.87208833j]
 [-0.36958257+0.2367042j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.5754956 +0.58703316j]
 [-0.56853285+0.03110098j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[ 0.37095581+0.92510235j]
 [-0.01081587-0.08037689j]]
```

———— Run time is 8658.467848300934 seconds ————

4.174.2 Qtrits

$$h^{(234)}(\vec{r}) = 5.8217 > 5 \quad (504)$$

———— RESULTS ————

VIOLATION: 5.821719006691083

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.68126913+0.22902662j]
 [0.62697803+0.30052907j]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.67606607-0.38418581j]
```

```
[-0.11256426+0.08706944j]
[-0.6124397 +0.00132494j]]
```

This is vector D:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.50693106-0.69064862j]
 [-0.16611561+0.26046655j]
 [ 0.1199798 +0.39521262j]]
```

This is vector E:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.2363414 +0.93208939j]
 [0.0992564 +0.16371726j]
 [0.09692976+0.17117699j]]
```

———— Run time is 6850.817314624786 seconds ————

4.174.3 Qquarts

$$h^{(234)}(\vec{r}) = 5.30524 > 5 \quad (505)$$

———— RESULTS ————

VIOLATION: 5.305248851876549

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.74345039+0.47969345j]
 [0.44336121+0.14354976j]
 [0.          +0.j          ]
 [0.          +0.j          ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
```

```

Qobj data =
[[0.52718442+0.38475395j]
 [0.302556   +0.41974219j]
 [0.47463758+0.28466911j]
 [0.         +0.j          ]]

```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[ 0.71137031-0.2581499j ]
 [-0.37019045+0.33274996j]
 [-0.29975321-0.26780646j]
 [-0.1105507  -0.07585288j]]

```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

```

Qobj data =
[[-0.11937889-0.86395099j]
 [ 0.17261102-0.321222j  ]
 [-0.16106926-0.26731862j]
 [-0.00712965-0.09437078j]]

```

———— Run time is 4478.358315944672 seconds ————

4.175 Equation 235

4.175.1 Qbits

$$h^{(235)}(\vec{r}) = 5.641359 > 5 \quad (506)$$

———— RESULTS ————

VIOLATION: 5.641359630179625

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[1.]
 [0.]]

```

This is vector B:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```

[[-0.75035137+0.53434509j]
 [-0.36388414+0.13797275j]]

```

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.19480109 - 0.71410791j \\ -0.12536715 + 0.66059481j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.64937062 - 0.75284601j \\ -0.10489811 + 0.02317474j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.4600984 - 0.75375714j \\ -0.01809431 - 0.46886271j \end{bmatrix}$

———— Run time is 6811.47376537323 seconds ————

4.175.2 Qtrits

$$h^{(235)}(\vec{r}) = 5.7845 > 5 \quad (507)$$

———— RESULTS ————

VIOLATION: 5.78454995814047

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.75637104 + 0.33679287j \\ 0.45537293 + 0.32727496j \\ 0. + 0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[ -0.90635656 -0.15144725j]
 [  0.35333683 +0.1680023j ]
 [  0.04595656 +0.01994548j ]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[  0.72315456 -0.56952067j]
 [-0.13138532 -0.00741613j]
 [  0.22869957 +0.28822404j ]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[  0.1955223  +0.34900747j]
 [  0.04356577 +0.01998515j]
 [-0.8569294  +0.32146452j ]]

```

———— Run time is 3312.5431661605835 seconds ————

4.175.3 Qquarts

$$h^{(235)}(\vec{r}) = 5.33498 > 5 \quad (508)$$

———— RESULTS ————

VIOLATION: 5.334984720600645

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.44526768+0.29060089j]
 [0.76129234+0.37110887j]
 [0.          +0.j          ]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.81994323+0.39612279j]
 [0.00754245+0.22579375j]
 [0.27719095+0.20713595j]
 [0.          +0.j          ]]

```

```

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.62078611+0.57402754j]
 [-0.37796327+0.20708565j]
 [-0.18327889+0.06504736j]
 [-0.10709262-0.22379712j]]

```

```

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.65186986+0.24888029j]
 [ 0.22175541+0.0794575j ]
 [ 0.35237918-0.21529605j]
 [-0.04415494-0.53400579j]]

```

———— Run time is 5993.917303085327 seconds ————

4.176 Equation 236

4.176.1 Qbits

$$h^{(236)}(\vec{r}) = 5.605932 > 5 \quad (509)$$

———— RESULTS ————

VIOLATION: 5.605932148737075

```

This is vector A:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[1.]
 [0.]]

```

```

This is vector B:
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.72759848-0.56761549j]

```

```
[ 0.35165629+0.15732439j ]]
```

This is vector C:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.6888172 -0.21950194j]
 [-0.68221984-0.10920556j]]
```

This is vector D:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[-0.28481194+0.8790659j ]
 [-0.03035393-0.38105635j]]
```

This is vector E:

```
Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =
[[0.72940784-0.66193281j]
 [0.04468663+0.16677012j]]
```

———— Run time is 1810.6099684238434 seconds ————

4.176.2 Qtrits

$$h^{(236)}(\vec{r}) = 5.81319 > 5 \quad (510)$$

———— RESULTS ————

VIOLATION: 5.8131962224054785

This is vector A:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.14210844+0.58548425j]
 [0.6801912 +0.41755636j]
 [0.          +0.j          ]]
```

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.85456025-0.05482252j \\ 0.18259698-0.00844435j \\ 0.04940407-0.48048679j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.26415903+0.74529252j \\ -0.20218724+0.01750791j \\ 0.57710668+0.0228197j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.23767036+0.85955824j \\ 0.39078148+0.09394553j \\ -0.15833959-0.13440637j \end{bmatrix}$

———— Run time is 16730.58572602272 seconds ————

4.176.3 Qquarts

$$h^{(236)}(\vec{r}) = 5.12146 > 5 \quad (511)$$

———— RESULTS ————

VIOLATION: 5.12146840291223

This is vector A:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.04528791+0.25441024j \\ 0.81673723+0.51591155j \\ 0. +0.j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.89642186+0.27269123j]
 [0.09927918+0.09478778j]
 [0.20442347+0.24786549j]
 [0.          +0.j          ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.48973169 -0.25736326j]
 [ -0.23999703 -0.17960419j]
 [  0.47112619 +0.26816389j]
 [ -0.55462694 -0.05087231j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.56693963 +0.17231655j]
 [ -0.47798597 +0.31431583j]
 [  0.22069927 -0.05862467j]
 [ -0.27859262 +0.4380212j ]]
```

———— Run time is 1340.263141155243 seconds ————

4.177 Equation 237

4.177.1 Qbits

$$h^{(237)}(\vec{r}) = 5.6290094 > 5 \quad (512)$$

———— RESULTS ————

VIOLATION: 5.629009436947139

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.39411171 - 0.6239793j \\ -0.23587175 - 0.63221065j \end{bmatrix}$

This is vector C:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.14729837 - 0.38875987j \\ 0.47606339 - 0.77494039j \end{bmatrix}$

This is vector D:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} -0.42881588 + 0.02572642j \\ -0.88672282 + 0.1708149j \end{bmatrix}$

This is vector E:
 Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.24648912 - 0.76542408j \\ 0.20184897 - 0.55912976j \end{bmatrix}$

———— Run time is 6651.813866376877 seconds ————

4.177.2 Qtrits

$$h^{(237)}(\vec{r}) = 5.76194 > 5 \quad (513)$$

———— RESULTS ————

VIOLATION: 5.7619498211915605

This is vector A:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
 Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
 Qobj data =
 $\begin{bmatrix} 0.26581783 + 0.71086856j \\ 0.04851131 + 0.64934846j \end{bmatrix}$

```
[0.          +0.j          ]]
```

This is vector C:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.38711288-0.0733431j ]
 [0.80091076+0.02771551j]
 [0.21699118-0.39427534j]]
```

This is vector D:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[0.29023539-0.18561898j]
 [0.57759917-0.60107102j]
 [0.11165174+0.41705603j]]
```

This is vector E:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

Qobj data =

```
[[ 0.84065755-0.35011125j]
 [ 0.17041455-0.36366424j]
 [-0.02644471-0.09340699j]]
```

———— Run time is 581.0611851215363 seconds ————

4.177.3 Qquarts

$$h^{(237)}(\vec{r}) = 5.70963 > 5 \quad (514)$$

———— RESULTS ————

VIOLATION: 5.709632995679594

This is vector A:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket

Qobj data =

```
[[0.48697957+0.62247477j]
```

```
[0.21862468+0.57234545j]
[0.          +0.j      ]
[0.          +0.j      ]]
```

This is vector C:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[0.30746815+0.41079147j]
 [0.39840228+0.50409742j]
 [0.21050562+0.5287367j ]
 [0.          +0.j      ]]
```

This is vector D:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ -0.08964904+0.40574806j]
 [ -0.45040958+0.62918943j]
 [  0.22846003-0.19026766j]
 [ -0.37142589+0.04722796j]]
```

This is vector E:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket

Qobj data =

```
[[ 0.05720583+0.88959883j]
 [-0.06902621+0.3023515j ]
 [-0.01165667+0.25750994j]
 [-0.17532552+0.10942618j]]
```

———— Run time is 45720.37379145622 seconds ————

4.178 Equation 238

4.178.1 Qbits

$$h^{(238)}(\vec{r}) = 5.62441 > 5 \quad (515)$$

———— RESULTS ————

VIOLATION: 5.624414832670173

This is vector A:

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket

Qobj data =

```
[[1.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[0.28580086+0.61868742j]$
 $[0.34133852+0.64732663j]]$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[0.26430322+0.21569704j]$
 $[0.58103041+0.73893318j]]$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[0.72701133-0.28366447j]$
 $[0.60410235-0.16139811j]]$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $[[0.32247476-0.28647586j]$
 $[0.53887876-0.72356845j]]$

———— Run time is 4370.90531039238 seconds ————
———— Run time is 16738.769253730774 seconds ————

4.178.2 Qtrits

$$h^{(238)}(\vec{r}) = 5.79425 > 5 \quad (516)$$

———— RESULTS ————

VIOLATION: 5.794251687492622

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $[[1.]$
 $[0.]$
 $[0.]]$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket

```

Qobj data =
[[0.79742018+0.38207721j]
 [0.1289841 +0.44888881j]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.22710418+0.30925527j]
 [ 0.0899117 +0.69980529j]
 [-0.44215132+0.39934387j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.08599239-0.67723855j]
 [0.55052831-0.41181207j]
 [0.24748964+0.00561537j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.01991009-0.33107621j]
 [ 0.50330198-0.74502825j]
 [-0.25255528-0.13352143j]]

```

———— Run time is 5613.319541215897 seconds ————

4.178.3 Qquarts

$$h^{(238)}(\vec{r}) = 5.6815557 > 5 \quad (517)$$

———— RESULTS ————

VIOLATION: 5.6815557745552345

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.87972398+0.435941j ]
 [0.08303346+0.1707238j]
 [0.          +0.j      ]
 [0.          +0.j      ]]

```

This is vector C:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.36924936+0.10295298j]
 [0.68957422+0.18644294j]
 [0.3952938  +0.4318852j ]
 [0.          +0.j      ]]

```

This is vector D:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.75923025+0.27720116j]
 [-0.5265828  +0.08492502j]
 [ 0.16629243-0.15066654j]
 [-0.06041336+0.09068568j]]

```

This is vector E:

```

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.10324657+0.39098956j]
 [-0.3465249  +0.58810433j]
 [ 0.47177329-0.3014457j ]
 [ 0.04178216+0.23523562j]]

```

———— Run time is 927.7654736042023 seconds ————

4.179 Equation 239

4.179.1 Qbits

$$h^{(239)}(\vec{r}) = 5.64843 > 5 \quad (518)$$

———— RESULTS ————

VIOLATION: 5.648431160836107

This is vector A:

```

Quantum object: dims = [[2], [1]], shape = (2, 1), type = ket
Qobj data =

```

```
[[1.]
 [0.]]
```

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.78054838 - 0.14418222j \\ 0.52063299 - 0.31447893j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.05880493 - 0.99683805j \\ -0.04486294 - 0.02903775j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.12770138 + 0.87362002j \\ 0.22638292 + 0.41137719j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.10671302 - 0.8841595j \\ -0.33702659 - 0.30542986j \end{bmatrix}$

———— Run time is 66.26070809364319 seconds ————
———— Run time is 21827.53577041626 seconds ————

4.179.2 Qtrits

$$h^{(239)}(\vec{r}) = 5.792881 > 5 \quad (519)$$

———— RESULTS ————

VIOLATION: 5.7928814398674655

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

```

This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.48999705+0.71503179j]
 [0.24319014+0.43530562j]
 [0.          +0.j          ]]

```

```

This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.91906307+0.33852543j]
 [-0.1967072  -0.00920794j]
 [ 0.03515656-0.02662916j]]

```

```

This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.28484269+0.72938305j]
 [ 0.05294859-0.41190205j]
 [-0.3850465  -0.25717182j]]

```

```

This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.70280686-0.24863865j]
 [ 0.5030393  +0.11983702j]
 [-0.29908587+0.29560031j]]

```

```

———— Run time is 1378.1168911457062 seconds ————

```

4.179.3 Qquarts

$$h^{(239)}(\vec{r}) = 5.54521 > 5 \quad (520)$$

```

———— RESULTS ————

```

```

VIOLATION: 5.545210019429153

```

```

This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]

```

This is vector B:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.56014803+0.36669115j] \\ [0.55989898+0.48814436j] \\ [0. +0.j] \\ [0. +0.j] \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [0.30809231+0.77553394j] \\ [0.14810791+0.48954768j] \\ [0.04172694+0.20072922j] \\ [0. +0.j] \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.72215536-0.22740331j] \\ [0.17119331-0.04405995j] \\ [-0.21853333-0.55343906j] \\ [0.12464503+0.16106819j] \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
Qobj data =
 $\begin{bmatrix} [-0.71653275+0.27115349j] \\ [0.28383953-0.00955599j] \\ [0.05181296+0.13312641j] \\ [-0.55721312-0.03881644j] \end{bmatrix}$

———— Run time is 1547.9432826042175 seconds ————

4.180 Equation 240

4.180.1 Qbits

$$h^{(240)}(\vec{r}) = 5.610084 > 5 \quad (521)$$

———— RESULTS ————

VIOLATION: 5.6100849423519

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.68059182+0.25662641j \\ 0.68564264-0.02884143j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.65534371+0.69424458j \\ 0.13987192+0.26264982j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.2720646 +0.94930556j \\ 0.12299376-0.09834802j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.87770369-0.25397438j \\ 0.39230029-0.1059893j \end{bmatrix}$

———— Run time is 1312.1372911930084 seconds ————

4.180.2 Qtrits

$$h^{(240)}(\vec{r}) = 5.76885 > 5 \quad (522)$$

———— RESULTS ————

VIOLATION: 5.768852884616849

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

[0.]

This is vector B:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.04294451+0.82990782j]
 [0.03860094+0.55490427j]
 [0. +0.j]]

This is vector C:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.00124421+0.79270934j]
 [-0.03556956-0.49739307j]
 [-0.0426962 +0.34802633j]]

This is vector D:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[-0.87695006-0.27367177j]
 [0.00281346-0.35134237j]
 [-0.04721963+0.17430804j]]

This is vector E:

Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.61801543+0.2016308j]
 [-0.40602828+0.00232286j]
 [-0.52474832-0.37037385j]]

———— Run time is 4745.248418569565 seconds ————

4.180.3 Qquarts

$$h^{(240)}(\vec{r}) = 5.54434 > 5 \quad (523)$$

———— RESULTS ————

VIOLATION: 5.544340119761173

This is vector A:

Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]

```
[0.]
[0.]]
```

This is vector B:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.22942274+0.93618082j]
 [0.25901221+0.06199478j]
 [0. +0.j]
 [0. +0.j]]

This is vector C:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.47238916+0.19023875j]
 [0.20175921+0.19016218j]
 [0.54589356+0.60480533j]
 [0. +0.j]]

This is vector D:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.6831612 +0.51753029j]
 [0.13025603+0.28094651j]
 [0.08240688+0.28606067j]
 [-0.26171441-0.11153283j]]

This is vector E:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.37228319-0.35045223j]
 [0.29900743-0.46916606j]
 [-0.00972361+0.19446887j]
 [0.38951922+0.48931413j]]

———— Run time is 897.0497400760651 seconds ————

4.181 Equation 241

4.181.1 Qbits

$$h^{(241)}(\vec{r}) = 5.607750 > 5 \quad (524)$$

———— RESULTS ————

VIOLATION: 5.6077507083980525

This is vector A:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.59157469-0.2247648j \\ -0.33009823-0.70039655j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.11818157+0.95652042j \\ -0.2102419 +0.16401261j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59649238-0.72719986j \\ 0.19977892-0.27470998j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.15982024-0.94287398j \\ -0.26834561-0.11591714j \end{bmatrix}$

Run time is 3092.688870191574 seconds

4.181.2 Qtrits

$$h^{(241)}(\vec{r}) = 5.7299 > 5 \quad (525)$$

RESULTS

VIOLATION: 5.72994360603306

This is vector A:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =

```
[[1.]
 [0.]
 [0.]]
```

```
This is vector B:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[0.73951422+0.52328405j]
 [0.18191327+0.3823612j ]
 [0.          +0.j       ]]
```

```
This is vector C:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.49572478-0.50215522j]
 [-0.5130887  -0.00856757j]
 [-0.46998673+0.13370165j]]
```

```
This is vector D:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.50593241-0.4765833j ]
 [-0.51635705+0.06315116j]
 [ 0.43156914-0.24502277j]]
```

```
This is vector E:
Quantum object: dims = [[3], [1]], shape = (3, 1), type = ket
Qobj data =
[[ 0.76750082+0.52271392j]
 [-0.07339837-0.1993202j ]
 [ 0.2733007  +0.13380402j]]
```

```
———— Run time is 2714.4684262275696 seconds ————
```

4.181.3 Qquarts

$$h^{(241)}(\vec{r}) = 5.3623 > 5 \quad (526)$$

```
———— RESULTS ————
```

```
VIOLATION: 5.362342939756765
```

```
This is vector A:
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
```

```
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

```
[[0.26641191+0.8096806j ]
 [0.52289089+0.00520972j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

```
[[0.59720041+0.11991829j]
 [0.19948678+0.35967511j]
 [0.29024723+0.61283494j]
 [0.          +0.j       ]]
```

This is vector D:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

```
[[ 0.47397683+0.33789534j]
 [-0.44220419+0.38878509j]
 [ 0.3189677  -0.23580888j]
 [-0.39447231+0.03898315j]]
```

This is vector E:

Quantum object: dims = $[[4], [1]]$, shape = (4, 1), type = ket
 Qobj data =

```
[[ 0.06727774-0.81519326j]
 [-0.30836589-0.23152255j]
 [ 0.06059191-0.34264267j]
 [ 0.24201642+0.05093234j]]
```

———— Run time is 1580.9381074905396 seconds ————

4.182 Equation 242

4.182.1 Qbits

$$h^{(242)}(\vec{r}) = 5.63091 > 5 \quad (527)$$

———— RESULTS ————

VIOLATION: 5.630919438041137

This is vector A:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \end{bmatrix}$

This is vector B:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.26701922+0.62357839j \\ 0.71241305+0.17977312j \end{bmatrix}$

This is vector C:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.71649705+0.3309969j \\ -0.26140546+0.55564397j \end{bmatrix}$

This is vector D:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.42311914+0.08545507j \\ -0.50388072+0.74817902j \end{bmatrix}$

This is vector E:

Quantum object: dims = $[[2], [1]]$, shape = (2, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.25196957-0.29810156j \\ 0.03853631-0.9198705j \end{bmatrix}$

———— Run time is 1729.8873546123505 seconds ————

4.182.2 Qtrits

$$h^{(242)}(\vec{r}) = 5.777759 > 5 \quad (528)$$

———— RESULTS ————

VIOLATION: 5.777759199838664

This is vector A:

Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 1. \\ 0. \\ 0. \end{bmatrix}$

This is vector B:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} 0.85757367+0.41044939j \\ 0.30305703+0.0652314j \\ 0. +0.j \end{bmatrix}$

This is vector C:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.59879852+0.35921225j \\ -0.44628494+0.4892556j \\ 0.18607115+0.19809879j \end{bmatrix}$

This is vector D:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.04244508-0.29689426j \\ -0.32403786-0.42296645j \\ -0.79128267+0.00477491j \end{bmatrix}$

This is vector E:
Quantum object: dims = $[[3], [1]]$, shape = (3, 1), type = ket
Qobj data =
 $\begin{bmatrix} -0.08246479-0.41410896j \\ -0.08815853-0.85568231j \\ 0.2424093 +0.15161437j \end{bmatrix}$

———— Run time is 1494.8794991970062 seconds ————

4.182.3 Qquarts

$$h^{(242)}(\vec{r}) = 5.74981 > 5 \quad (529)$$

———— RESULTS ————

VIOLATION: 5.749814693350813

This is vector A:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[1.]
 [0.]
 [0.]
 [0.]]
```

This is vector B:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.85798693+0.25619502j]
 [0.40575495+0.18326336j]
 [0.          +0.j       ]
 [0.          +0.j       ]]
```

This is vector C:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[0.86929371+0.35423272j]
 [0.26284193+0.20434025j]
 [0.06634871+0.06003881j]
 [0.          +0.j       ]]
```

This is vector D:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[ 0.52990013+0.01406704j]
 [ 0.52924351+0.32436968j]
 [-0.05303788+0.43396505j]
 [-0.25011964-0.28283398j]]
```

This is vector E:

```
Quantum object: dims = [[4], [1]], shape = (4, 1), type = ket
Qobj data =
[[-0.453206   +0.20351139j]
 [-0.60964322+0.12256701j]
 [ 0.22006286+0.17685359j]
 [-0.52352529-0.11276666j]]
```

———— Run time is 2341.124205827713 seconds ————