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Experiment No.	1 A

PROBLEM STATEMENT:

For this experiment, you have to implement at least 10 functions from the following list.

$$\left(\tfrac{3}{2}\right)^n \qquad n^3 \qquad \lg^2 n \qquad \lg(n!) \qquad 2^{2^n} \qquad n^{1/\lg n}$$

$$\ln \ln n \qquad \lg\, n \qquad n \cdot 2^n \qquad n^{\lg \lg n} \qquad \ln n \qquad 2^{\lg\, n}$$

$$2^{\lg n} \qquad (\lg n)^{\lg n} \qquad e^n \qquad (\lg n)! \qquad (\sqrt{2})^{\lg n} \qquad \sqrt{\lg n}$$

$$\lg\,(\lg n) \qquad 2^{\sqrt{2 \lg n}} \qquad n \qquad 2^n \qquad n \lg n \qquad 2^{2^{n+1}}$$

Note – *lg* denotes for log_2 and *le* denotes log_e

The input (i.e. n) to all the above functions varies from 0 to 100 with increment of 1. Then add the function n! in the list and execute the same for n from 0 to 20.

Algorithm/Theory:

1. Start
2. Declare and define 11 functions.
3. Print the functions name.
3. Run the for loop 100 times for invoking the functions and providing 0 to 100 as an Input.

      for(int j=0; j <= 100; j++){
          invoking function1();
          invoking function2();
          invoking function3();
          .
          .
          .
          Invoking function11();
      }

4. After invoking the function inside loop, print the values return by the function at each input.
5. Repeat step 3 and 4 until every function has been invoked 100 times for 100 inputs.
6. Stop.

RESULT:

ine-Out-qp5n00yv.ui2' '--stderr=Microsoft-MIEngine-Error-r32xfbz5.jot' '--pid=Microsoft-MIEngine-Pid-ag0utneo.ndc' '--dbgExe=C:\msys64\mingw64\bin\gdb.exe' '--interpreter=mi'

| Input	FUNCTION 1(2^n)	FUNCTION 2(n)	FUNCTION3(log2(n))	FUNCTION4(n*log(n))	FUNCTION5(Sqr(log(n)))
n=0	0	1.0	-inf	nan	nan
n=1	1	2.0	0.000000	0.000000	0.000000
n=2	2	4.0	1.000000	1.386294	1.000000
n=3	3	8.0	1.584963	3.295837	1.258953
n=4	4	16.0	2.000000	5.545177	1.414214
n=5	5	32.0	2.321928	8.047190	1.523787
n=6	6	64.0	2.584963	10.750557	1.607782
n=7	7	128.0	2.807355	13.621371	1.675516
n=8	8	256.0	3.000000	16.635532	1.732051
n=9	9	512.0	3.169925	19.775021	1.780428
n=10	10	1024.0	3.321928	23.025851	1.822616
n=11	11	2048.0	3.459432	26.376848	1.859955
n=12	12	4096.0	3.584963	29.818880	1.893400
n=13	13	8192.0	3.700440	33.344342	1.923653
n=14	14	16384.0	3.807355	36.946803	1.951244
n=15	15	32768.0	3.906891	40.620753	1.976586
n=16	16	65536.0	4.000000	44.361420	2.000000
n=17	17	131072.0	4.087463	48.164627	2.021747
n=18	18	262144.0	4.169925	52.026692	2.042039
n=19	19	524288.0	4.247928	55.944341	2.061050
n=20	20	1048576.0	4.321928	59.914645	2.078925
n=21	21	2097152.0	4.392317	63.934971	2.095786
n=22	22	4194304.0	4.459432	68.002934	2.111737
n=23	23	8388608.0	4.523562	72.116367	2.126867
n=24	24	16777216.0	4.584963	76.273292	2.141253
n=25	25	33554432.0	4.643856	80.471896	2.154961
n=26	26	67108864.0	4.700440	84.710510	2.168050
n=27	27	134217728.0	4.754888	88.987595	2.180570
n=28	28	268435456.0	4.807355	93.301726	2.192568
n=29	29	536870912.0	4.857981	97.651579	2.204083
n=30	30	1073741824.0	4.906891	102.035921	2.215150
n=31	31	2147483648.0	4.954196	106.453603	2.225802
n=32	32	4294967296.0	5.000000	110.903549	2.236068
n=33	33	8589934592.0	5.044394	115.384750	2.245973
n=34	34	17179869184.0	5.087463	119.896258	2.255540
n=35	35	34359738368.0	5.129283	124.437182	2.264792
n=36	36	68719476736.0	5.169925	129.006682	2.273747
n=37	37	137438953472.0	5.209453	133.603963	2.282423
n=38	38	274877906944.0	5.247928	138.228274	2.290836
n=39	39	549755813888.0	5.285402	142.878904	2.299000
n=40	40	1099511627776.0	5.321928	147.555178	2.306930
n=41	41	2199023255552.0	5.357552	152.256455	2.314639
n=42	42	4398046511104.0	5.392317	156.982124	2.322136
n=43	43	8796093022208.0	5.426265	161.731605	2.329434
n=44	44	17592186044416.0	5.459432	166.504344	2.336543
n=45	45	35184372088832.0	5.491853	171.299812	2.343470
n=46	46	70368744177664.0	5.523562	176.117504	2.350226
n=47	47	140737488355328.0	5.554589	180.956937	2.356818
n=48	48	281474976710656.0	5.584963	185.817649	2.363253
n=49	49	562949953421312.0	5.614710	190.699195	2.369538
n=50	50	1125899906842624.0	5.643856	195.601150	2.375680
n=51	51	2251799813685248.0	5.672425	200.523107	2.381685
n=52	52	4503599627370496.0	5.700440	205.464673	2.387559
n=53	53	9007199254740992.0	5.727920	210.425471	2.393307
n=54	54	18014398509481984.0	5.754888	215.405139	2.398935
n=55	55	36028797018963968.0	5.781360	220.403325	2.404446
n=56	56	72057594037927936.0	5.807355	225.419695	2.409845
n=57	57	144115188075855872.0	5.832890	230.453922	2.415138
n=58	58	288230376151711744.0	5.857981	235.505695	2.420327
n=59	59	576460752303423488.0	5.882643	240.574709	2.425416
n=60	60	1152921504606846976.0	5.906891	245.660674	2.430410
n=61	61	2305843009213693952.0	5.930737	250.763306	2.435311
n=62	62	4611686018427387904.0	5.954196	255.882332	2.440122
n=63	63	9223372036854775808.0	5.977280	261.017488	2.444848
n=64	64	18446744073709551616.0	6.000000	266.168517	2.449490
n=65	65	36893488147419103232.0	6.022368	271.335173	2.454051
n=66	66	73786976294838206464.0	6.044394	276.517213	2.458535
n=67	67	147573952589676412928.0	6.066089	281.714405	2.462943
n=68	68	295147905179352825856.0	6.087463	286.926524	2.467278
n=69	69	590295810358705651712.0	6.108524	292.153349	2.471543
n=70	70	1180591620717411303424.0	6.129283	297.394667	2.475739
n=71	71	2361183241434822606848.0	6.149747	302.650271	2.479868
n=72	72	4722366482869645213696.0	6.169925	307.919961	2.483933
n=73	73	9444732965739290427392.0	6.189825	313.203539	2.487936
n=74	74	18889465931478580854784.0	6.209453	318.500817	2.491877
n=75	75	37778931862957161709568.0	6.228819	323.811609	2.495760
n=76	76	75557863725914323419136.0	6.247928	329.135734	2.499585
n=77	77	151115727451828646838272.0	6.266787	334.473017	2.503355
n=78	78	302231454903657293676544.0	6.285402	339.823288	2.507070
n=79	79	604462909807314587353088.0	6.303781	345.186380	2.510733
n=80	80	1208925819614629174706176.0	6.321928	350.562131	2.514344
n=81	81	2417851639229258349412352.0	6.339850	355.950382	2.517906
n=82	82	4835703278458516698824704.0	6.357552	361.350978	2.521419
n=83	83	9671406556917033397649408.0	6.375039	366.763770	2.524884
n=84	84	19342813113834066795298816.0	6.392317	372.188611	2.528303
n=85	85	38685626227668133590597632.0	6.409391	377.625357	2.531677
n=86	86	77371252455336267181195264.0	6.426265	383.073867	2.535008
n=87	87	154742504910672534362390528.0	6.442943	388.534006	2.538295
n=88	88	309485009821345068724781056.0	6.459432	394.005640	2.541541
n=89	89	618970019642690137449562112.0	6.475733	399.488637	2.544746
n=90	90	1237940039285380274899124224.0	6.491853	404.982870	2.547912
n=91	91	2475880078570760549798248448.0	6.507795	410.488215	2.551038
n=92	92	4951760157141521099596496896.0	6.523562	416.004549	2.554126
n=93	93	9903520314283042199192993792.0	6.539159	421.531753	2.557178
n=94	94	19807040628566084398385987584.0	6.554589	427.069710	2.560193
n=95	95	39614081257132168796771975168.0	6.569856	432.618305	2.563173
n=96	96	79228162514264337593543950336.0	6.584963	438.177426	2.566118
n=97	97	158456325028528675187087900672.0	6.599913	443.746965	2.569030
n=98	98	316912650057057350374175801344.0	6.614710	449.326813	2.571908
n=99	99	633825300114114700748351602688.0	6.629357	454.916865	2.574754
n=100	100	1267650600228229401496703205376.0	6.643856	460.517019	2.577568

Ln 54, Col 155

Input	FUNCTION6((3/2)^n)	FUNCTION7(n^3)	FUNCTION8(2^log2(n))	FUNCTION9(n*2^n)	FUNCTION10(log2(log2(n)))
n=0	1.0	0	0.00	0.0	nan
n=1	2.0	1	1.00	1.0	-inf
n=2	2.0	8	2.00	2.0	0.000000
n=3	3.0	27	3.00	3.0	0.664449
n=4	5.0	64	4.00	4.0	1.000000
n=5	8.0	125	5.00	5.0	1.215323
n=6	11.0	216	6.00	6.0	1.370143
n=7	17.0	343	7.00	7.0	1.489211
n=8	26.0	512	8.00	8.0	1.584963
n=9	38.0	729	9.00	9.0	1.664449
n=10	58.0	1000	10.00	10.0	1.732021
n=11	86.0	1331	11.00	11.0	1.790535
n=12	130.0	1728	12.00	12.0	1.841958
n=13	195.0	2197	13.00	13.0	1.887697
n=14	292.0	2744	14.00	14.0	1.928789
n=15	438.0	3375	15.00	15.0	1.966021
n=16	657.0	4096	16.00	16.0	2.000000
n=17	985.0	4913	17.00	17.0	2.031206
n=18	1478.0	5832	18.00	18.0	2.060021
n=19	2217.0	6859	19.00	19.0	2.086759
n=20	3325.0	8000	20.00	20.0	2.111675
n=21	4988.0	9261	21.00	21.0	2.134982
n=22	7482.0	10648	22.00	22.0	2.156860
n=23	11223.0	12167	23.00	23.0	2.177459
n=24	16834.0	13824	24.00	24.0	2.196910
n=25	25251.0	15625	25.00	25.0	2.215323
n=26	37877.0	17576	26.00	26.0	2.232796
n=27	56815.0	19683	27.00	27.0	2.249411
n=28	85223.0	21952	28.00	28.0	2.265243
n=29	127834.0	24389	29.00	29.0	2.280357
n=30	191751.0	27000	30.00	30.0	2.294809
n=31	287627.0	29791	31.00	31.0	2.308651
n=32	431440.0	32768	32.00	32.0	2.321928
n=33	647160.0	35937	33.00	33.0	2.334681
n=34	970740.0	39304	34.00	34.0	2.346946
n=35	1456110.0	42875	35.00	35.0	2.358757
n=36	2184164.0	46656	36.00	36.0	2.370143
n=37	3276247.0	50653	37.00	37.0	2.381132
n=38	4914370.0	54872	38.00	38.0	2.391748
n=39	7371555.0	59319	39.00	39.0	2.402013
n=40	11057332.0	64000	40.00	40.0	2.411949
n=41	16585998.0	68921	41.00	41.0	2.421574
n=42	24878998.0	74088	42.00	42.0	2.430905
n=43	37318497.0	79507	43.00	43.0	2.439959
n=44	55977745.0	85184	44.00	44.0	2.448751
n=45	83966617.0	91125	45.00	45.0	2.457293
n=46	125949926.0	97336	46.00	46.0	2.465599
n=47	188924889.0	103823	47.00	47.0	2.473680
n=48	283387333.0	110592	48.00	48.0	2.481548
n=49	425081000.0	117649	49.00	49.0	2.489211
n=50	637621500.0	125000	50.00	50.0	2.496681
n=50	637621500.0	125000	50.00	50.0	2.496681
n=51	956432250.0	132651	51.00	51.0	2.503966
n=52	1434648375.0	140608	52.00	52.0	2.511073
n=53	2151972563.0	148877	53.00	53.0	2.518011
n=54	3227958845.0	157464	54.00	54.0	2.524788
n=55	4841938267.0	166375	55.00	55.0	2.531409
n=56	7262907401.0	175616	56.00	56.0	2.537881
n=57	10894361101.0	185193	57.00	57.0	2.544211
n=58	16341541652.0	195112	58.00	58.0	2.550404
n=59	24512312478.0	205379	59.00	59.0	2.556464
n=60	36768468717.0	216000	60.00	60.0	2.562399
n=61	55152703075.0	226981	61.00	61.0	2.568211
n=62	82729054613.0	238328	62.00	62.0	2.573907
n=63	124093581920.0	250047	63.00	63.0	2.579489
n=64	186140372879.0	262144	64.00	64.0	2.584963
n=65	279210559319.0	274625	65.00	65.0	2.590331
n=66	418815838979.0	287496	66.00	66.0	2.595598
n=67	628223758468.0	300763	67.00	67.0	2.600767
n=68	942335637702.0	314432	68.00	68.0	2.605841
n=69	1413503456554.0	328509	69.00	69.0	2.610824
n=70	2120255184830.0	343000	70.00	70.0	2.615718
n=71	3180382777245.0	357911	71.00	71.0	2.620527
n=72	4770574165868.0	373248	72.00	72.0	2.625253
n=73	7155861248802.0	389017	73.00	73.0	2.629899
n=74	10733791873203.0	405224	74.00	74.0	2.634466
n=75	16100687809805.0	421875	75.00	75.0	2.638959
n=76	24151031714707.0	438976	76.00	76.0	2.643378
n=77	36226547572061.0	456533	77.00	77.0	2.647726
n=78	54339821358091.0	474552	78.00	78.0	2.652005
n=79	81509732037136.0	493039	79.00	79.0	2.656217
n=80	122264598055705.0	512000	80.00	80.0	2.660365
n=81	183396897083557.0	531441	81.00	81.0	2.664449
n=82	275095345625335.0	551368	82.00	82.0	2.668471
n=83	412643018438003.0	571787	83.00	83.0	2.672434
n=84	618964527657005.0	592704	84.00	84.0	2.676339
n=85	928446791485507.0	614125	85.00	85.0	2.680187
n=86	1392670187228261.0	636056	86.00	86.0	2.683980
n=87	2089005280842391.0	658503	87.00	87.0	2.687720
n=88	3133507921263587.0	681472	88.00	88.0	2.691407
n=89	4700261881895380.0	704969	89.00	89.0	2.695044
n=90	7050392822843069.0	729000	90.00	90.0	2.698630
n=91	10575589234264604.0	753571	91.00	91.0	2.702169
n=92	15863383851396906.0	778688	92.00	92.0	2.705660
n=93	23795075777095360.0	804357	93.00	93.0	2.709105
n=94	35692613665643040.0	830584	94.00	94.0	2.712505
n=95	53538920498464560.0	857375	95.00	95.0	2.715862
n=96	80308380747696832.0	884736	96.00	96.0	2.719175
n=97	120462571121545248.0	912673	97.00	97.0	2.722447
n=98	180693856682317856.0	941192	98.00	98.0	2.725678
n=99	271040785023476800.0	970299	99.00	99.0	2.728869
n=100	406561177535215296.0	1000000	100.00	100.0	2.732021

```
INPUT            FUNCTION11(n*n=1!)n=0
                                1.000000
n=1
                                1.000000
n=2
                                2.000000
n=3
                                6.000000
n=4
                                24.000000
n=5
                                120.000000
n=6
                                720.000000
n=7
                                5040.000000
n=8
                                40320.000000
n=9
                                362880.000000
n=10
                                3628800.000000
n=11
                                39916800.000000
n=12
                                479001600.000000
n=13
                                6227020800.000000
n=14
                                87178291200.000000
n=15
                                1307674368000.000000
n=16
                                20922789888000.000000
n=17
                                355687428096000.000000
n=18
                                6402373705728000.000000
n=19
                                121645100408832000.000000
n=20
                                2432902008176640000.000000
PS D:\Engineering\Program>
```

Graph:
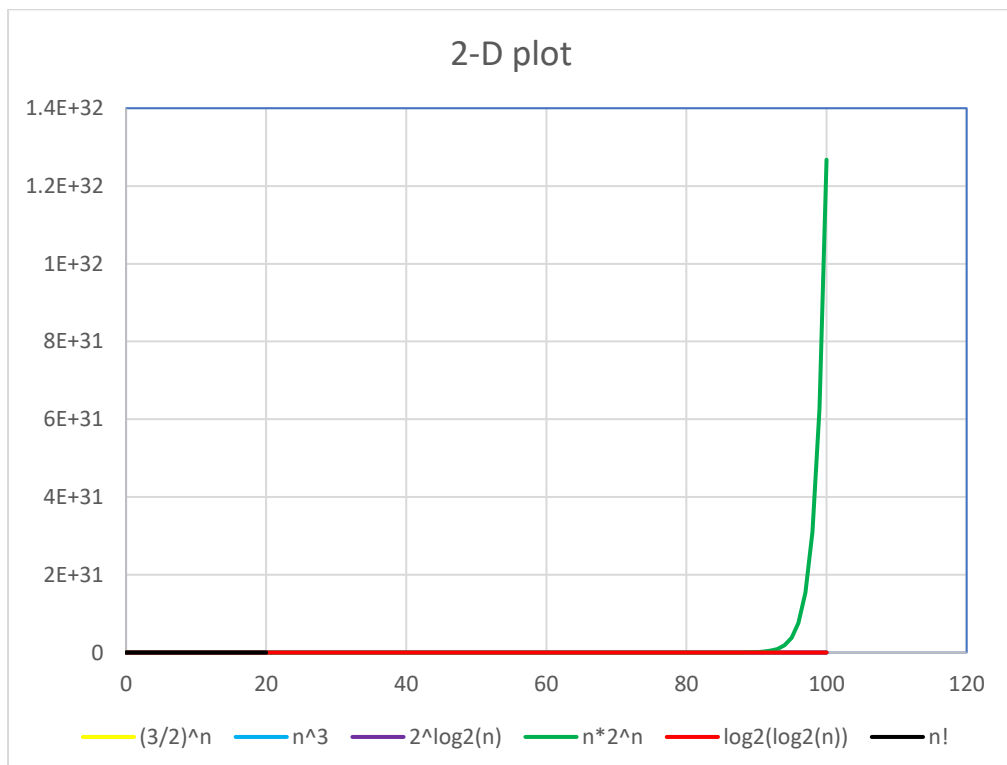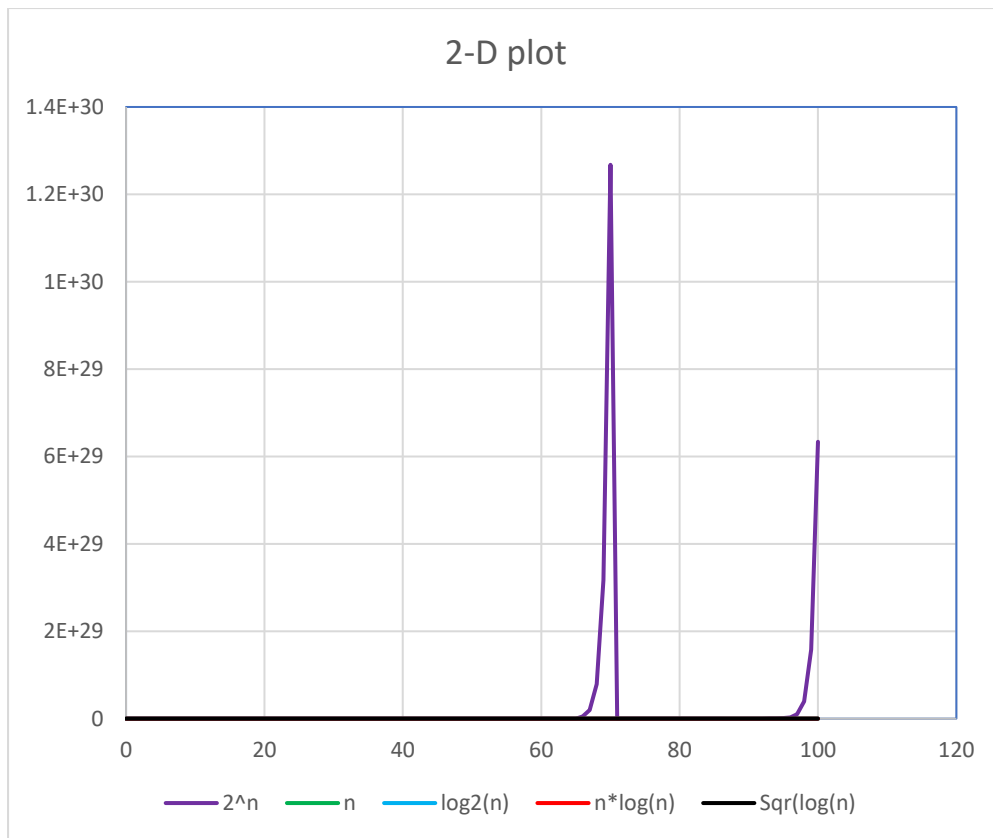
Observation:

We have plotted 2-D graph, X-axis representing 0 to 100 inputs and Y-axis representing the value
Generated by the functions.
By observing the output of each function in the graph, most of the function has produces
Almost same value or value nearer to each other, therefore in the graph it is difficult to spot the
difference between the output generated by every function.

Conclusion:

Thus, we have implemented various functions e.g. linear, non-linear, quadratic, exponential etc.