

Python 3.7.0 (default, Jun 28 2018, 07:39:16)
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IPython 7.8.0 -- An enhanced Interactive Python.

Nodes along x axis:

0	0.000000
1	0.100000
2	0.200000
3	0.300000
4	0.400000
5	0.500000
6	0.600000
7	0.700000
8	0.800000
9	0.900000
10	1.000000

The elements, listing the nodes in counterclockwise order

0	1	12	11
1	2	13	12
2	3	14	13
3	4	15	14
4	5	16	15
5	6	17	16
6	7	18	17
7	8	19	18
8	9	20	19
9	10	21	20
11	12	23	22
12	13	24	23
13	14	25	24
14	15	26	25
15	16	27	26
16	17	28	27
17	18	29	28
18	19	30	29
19	20	31	30
20	21	32	31
22	23	34	33
23	24	35	34
24	25	36	35
25	26	37	36
26	27	38	37
27	28	39	38
28	29	40	39
29	30	41	40
30	31	42	41

31	32	43	42
33	34	45	44
34	35	46	45
35	36	47	46
36	37	48	47
37	38	49	48
38	39	50	49
39	40	51	50
40	41	52	51
41	42	53	52
42	43	54	53
44	45	56	55
45	46	57	56
46	47	58	57
47	48	59	58
48	49	60	59
49	50	61	60
50	51	62	61
51	52	63	62
52	53	64	63
53	54	65	64
55	56	67	66
56	57	68	67
57	58	69	68
58	59	70	69
59	60	71	70
60	61	72	71
61	62	73	72
62	63	74	73
63	64	75	74
64	65	76	75
66	67	78	77
67	68	79	78
68	69	80	79
69	70	81	80
70	71	82	81
71	72	83	82
72	73	84	83
73	74	85	84
74	75	86	85
75	76	87	86
77	78	89	88
78	79	90	89
79	80	91	90
80	81	92	91
81	82	93	92
82	83	94	93
83	84	95	94
84	85	96	95
85	86	97	96

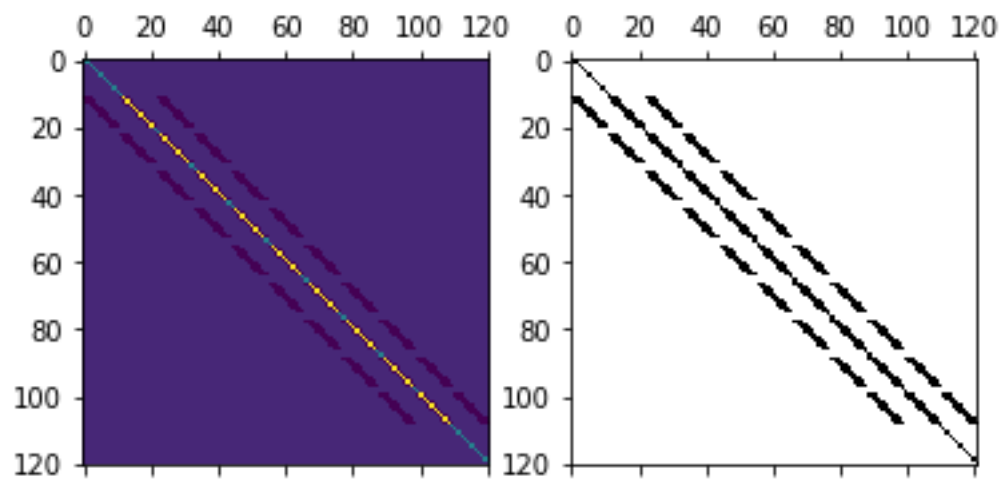
86	87	98	97
88	89	100	99
89	90	101	100
90	91	102	101
91	92	103	102
92	93	104	103
93	94	105	104
94	95	106	105
95	96	107	106
96	97	108	107
97	98	109	108
99	100	111	110
100	101	112	111
101	102	113	112
102	103	114	113
103	104	115	114
104	105	116	115
105	106	117	116
106	107	118	117
107	108	119	118
108	109	120	119

Node	x	y	u	u_exact
0	0.000000	0.000000	0	0
1	0.100000	0.000000	0	0
2	0.200000	0.000000	0	0
3	0.300000	0.000000	0	0
4	0.400000	0.000000	0	0
5	0.500000	0.000000	0	0
6	0.600000	0.000000	0	0
7	0.700000	0.000000	0	0
8	0.800000	0.000000	0	0
9	0.900000	0.000000	0	0
10	1.000000	0.000000	0	0
11	0.000000	0.100000	0	0
12	0.100000	0.100000	0.00818943	0.0081
13	0.200000	0.100000	0.014541	0.0144
14	0.300000	0.100000	0.0190724	0.0189
15	0.400000	0.100000	0.0217896	0.0216
16	0.500000	0.100000	0.022695	0.0225
17	0.600000	0.100000	0.0217896	0.0216
18	0.700000	0.100000	0.0190724	0.0189
19	0.800000	0.100000	0.014541	0.0144
20	0.900000	0.100000	0.00818943	0.0081
21	1.000000	0.100000	0	0
22	0.000000	0.200000	0	0
23	0.100000	0.200000	0.014541	0.0144
24	0.200000	0.200000	0.0258335	0.0256
25	0.300000	0.200000	0.0338915	0.0336

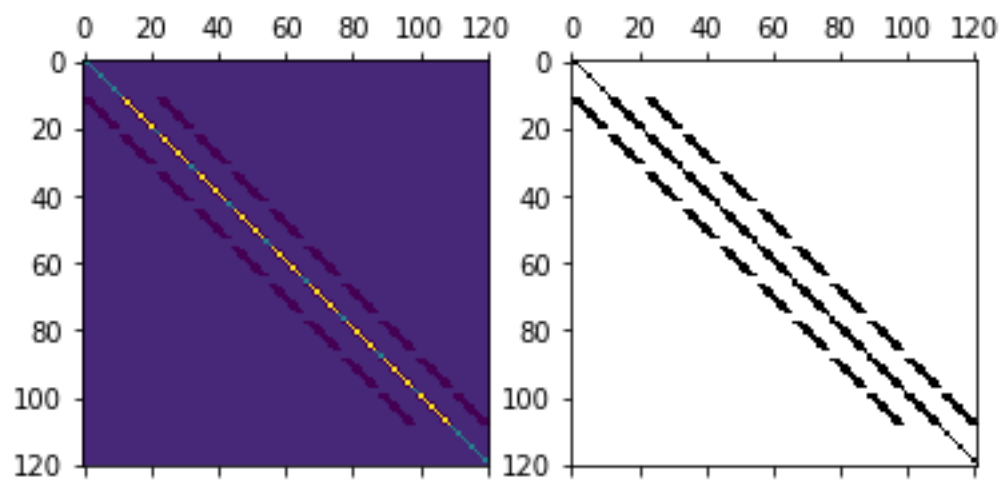
26	0.400000	0.200000	0.0387236	0.0384
27	0.500000	0.200000	0.0403339	0.04
28	0.600000	0.200000	0.0387236	0.0384
29	0.700000	0.200000	0.0338915	0.0336
30	0.800000	0.200000	0.0258335	0.0256
31	0.900000	0.200000	0.014541	0.0144
32	1.000000	0.200000	0	0
33	0.000000	0.300000	0	0
34	0.100000	0.300000	0.0190724	0.0189
35	0.200000	0.300000	0.0338915	0.0336
36	0.300000	0.300000	0.0444687	0.0441
37	0.400000	0.300000	0.050812	0.0504
38	0.500000	0.300000	0.0529259	0.0525
39	0.600000	0.300000	0.050812	0.0504
40	0.700000	0.300000	0.0444687	0.0441
41	0.800000	0.300000	0.0338915	0.0336
42	0.900000	0.300000	0.0190724	0.0189
43	1.000000	0.300000	0	0
44	0.000000	0.400000	0	0
45	0.100000	0.400000	0.0217896	0.0216
46	0.200000	0.400000	0.0387236	0.0384
47	0.300000	0.400000	0.050812	0.0504
48	0.400000	0.400000	0.058062	0.0576
49	0.500000	0.400000	0.0604781	0.06
50	0.600000	0.400000	0.058062	0.0576
51	0.700000	0.400000	0.050812	0.0504
52	0.800000	0.400000	0.0387236	0.0384
53	0.900000	0.400000	0.0217896	0.0216
54	1.000000	0.400000	0	0
55	0.000000	0.500000	0	0
56	0.100000	0.500000	0.022695	0.0225
57	0.200000	0.500000	0.0403339	0.04
58	0.300000	0.500000	0.0529259	0.0525
59	0.400000	0.500000	0.0604781	0.06
60	0.500000	0.500000	0.0629951	0.0625
61	0.600000	0.500000	0.0604781	0.06
62	0.700000	0.500000	0.0529259	0.0525
63	0.800000	0.500000	0.0403339	0.04
64	0.900000	0.500000	0.022695	0.0225
65	1.000000	0.500000	0	0
66	0.000000	0.600000	0	0
67	0.100000	0.600000	0.0217896	0.0216
68	0.200000	0.600000	0.0387236	0.0384
69	0.300000	0.600000	0.050812	0.0504
70	0.400000	0.600000	0.058062	0.0576
71	0.500000	0.600000	0.0604781	0.06
72	0.600000	0.600000	0.058062	0.0576
73	0.700000	0.600000	0.050812	0.0504
74	0.800000	0.600000	0.0387236	0.0384
75	0.900000	0.600000	0.0217896	0.0216

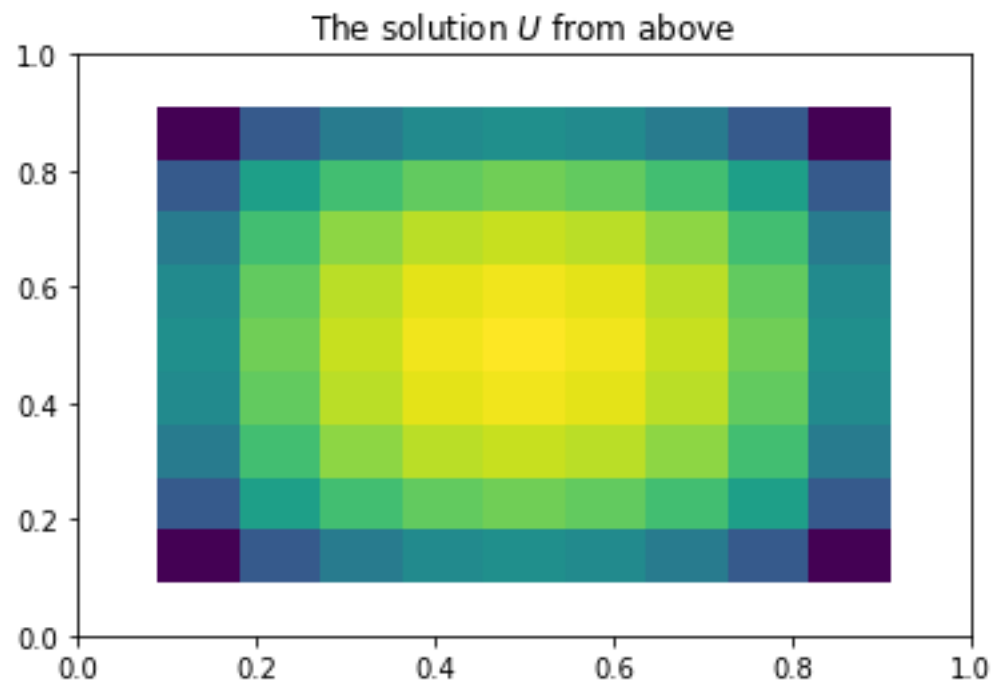
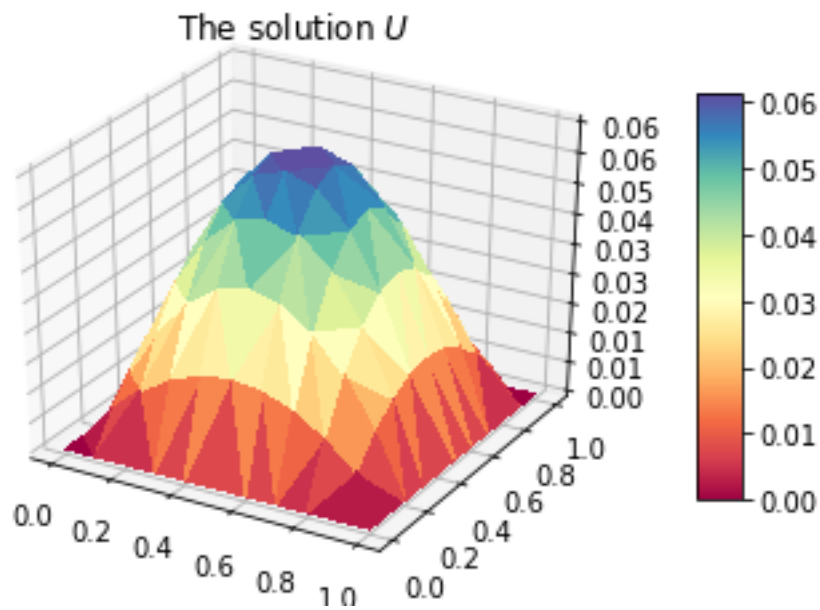
76	1.000000	0.600000	0	0
77	0.000000	0.700000	0	0
78	0.100000	0.700000	0.0190724	0.0189
79	0.200000	0.700000	0.0338915	0.0336
80	0.300000	0.700000	0.0444687	0.0441
81	0.400000	0.700000	0.050812	0.0504
82	0.500000	0.700000	0.0529259	0.0525
83	0.600000	0.700000	0.050812	0.0504
84	0.700000	0.700000	0.0444687	0.0441
85	0.800000	0.700000	0.0338915	0.0336
86	0.900000	0.700000	0.0190724	0.0189
87	1.000000	0.700000	0	0
88	0.000000	0.800000	0	0
89	0.100000	0.800000	0.014541	0.0144
90	0.200000	0.800000	0.0258335	0.0256
91	0.300000	0.800000	0.0338915	0.0336
92	0.400000	0.800000	0.0387236	0.0384
93	0.500000	0.800000	0.0403339	0.04
94	0.600000	0.800000	0.0387236	0.0384
95	0.700000	0.800000	0.0338915	0.0336
96	0.800000	0.800000	0.0258335	0.0256
97	0.900000	0.800000	0.014541	0.0144
98	1.000000	0.800000	0	0
99	0.000000	0.900000	0	0
100	0.100000	0.900000	0.00818943	0.0081
101	0.200000	0.900000	0.014541	0.0144
102	0.300000	0.900000	0.0190724	0.0189
103	0.400000	0.900000	0.0217896	0.0216
104	0.500000	0.900000	0.022695	0.0225
105	0.600000	0.900000	0.0217896	0.0216
106	0.700000	0.900000	0.0190724	0.0189
107	0.800000	0.900000	0.014541	0.0144
108	0.900000	0.900000	0.00818943	0.0081
109	1.000000	0.900000	0	0
110	0.000000	1.000000	0	0
111	0.100000	1.000000	0	0
112	0.200000	1.000000	0	0
113	0.300000	1.000000	0	0
114	0.400000	1.000000	0	0
115	0.500000	1.000000	0	0
116	0.600000	1.000000	0	0
117	0.700000	1.000000	0	0
118	0.800000	1.000000	0	0
119	0.900000	1.000000	0	0
120	1.000000	1.000000	0	0

The Stiffness Matrix



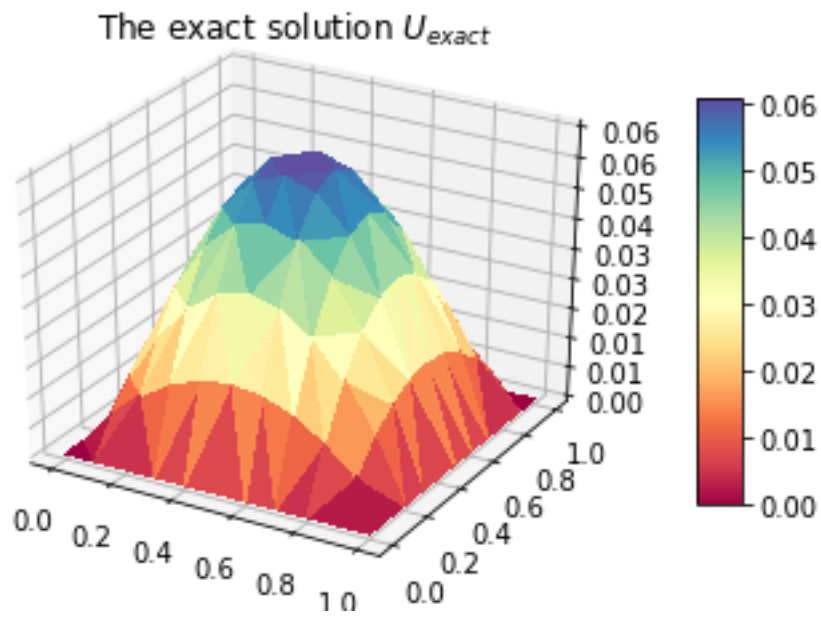
The Stiffness Matrix with BC contribution



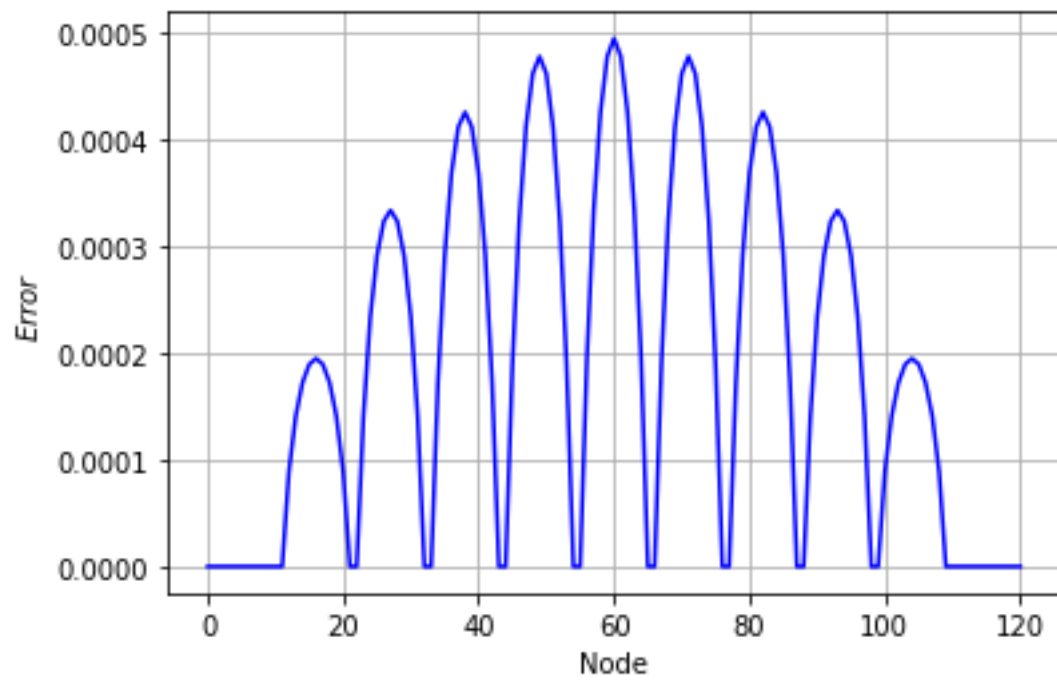


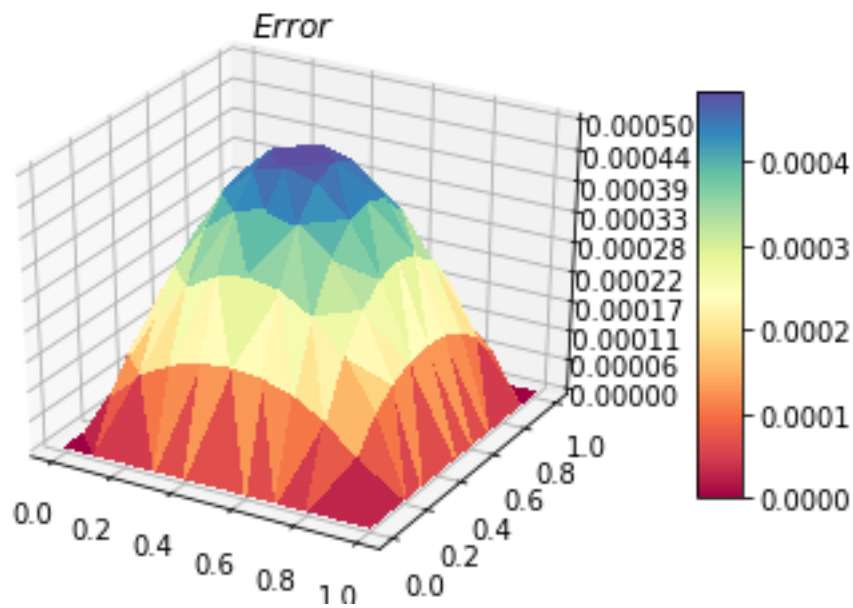
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The Exact Solution
 $U_{\text{exact}} = xy(1-x)(1-y)$
 evaluated on each node is



#####





The L2 error = 0.0003794744390722252

The H1 error = 0.014929279549913868

#####

>> Normal end of execution.

In [2]: