Advanced Numerical Techniques

Assignment - 9

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Question 1

Solve using line-by-line algorithm :-

$\nabla^2 u = x^2 + y^2$

$0 < x < 1$

$0 < y < 1$

$u(x, y) = 0$ on the boundary.

$\delta x = \delta y = 0.25$

Solution:

K=0

```
[[ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]]
[[ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]
 [ 0.  0.  0.  0.  0.]]
0.00322606493167
K= 1
[[ 0.          0.          0.          0.          0.        ]
 [ 0.         -0.00418527 -0.00892857 -0.01199777  0.        ]
 [ 0.         -0.01034359 -0.01765784 -0.02010922  0.        ]
 [ 0.         -0.01973695 -0.02954173 -0.02999086  0.        ]
 [ 0.          0.          0.          0.          0.        ]]
```

```
[[ 0.          0.          0.          0.          0.        ]
 [ 0.         -0.00857624 -0.01614887 -0.01883015  0.        ]
 [ 0.         -0.02008984 -0.03251494 -0.0330293   0.        ]
 [ 0.         -0.02363949 -0.03540563 -0.03468686  0.        ]
 [ 0.          0.          0.          0.          0.        ]]
0.0
K= 2
[[ 0.          0.          0.          0.          0.        ]
 [ 0.         -0.00857624 -0.01614887 -0.01883015  0.        ]
 [ 0.         -0.02008984 -0.03251494 -0.0330293   0.        ]
 [ 0.         -0.02363949 -0.03540563 -0.03468686  0.        ]
 [ 0.          0.          0.          0.          0.        ]]
```