```
Python 3.7.0 (default, Jun 28 2018, 07:39:16)
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IPython 7.4.0 -- An enhanced Interactive Python.

In [1]:
runfile('/Users/maged/Documents/GitHub/PoissonSolver2D/PossionSolver2D.py',
wdir='/Users/maged/Documents/GitHub/PoissonSolver2D')
The Stiffness Matrix(A) =
 [[ 1.  -0.5  0.   0.   0.  -0.5  0.   0.   0.   0.   0.   0.   0.   0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [-0.5  2.  -0.5  0.   0.   0.  -1.   0.   0.   0.   0.   0.   0.   0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.  -0.5  2.  -0.5  0.   0.   0.  -1.   0.   0.   0.   0.   0.   0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.  -0.5  2.  -0.5  0.   0.   0.  -1.   0.   0.   0.   0.   0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.  -0.5  1.   0.   0.   0.   0.  -0.5  0.   0.   0.   0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [-0.5  0.   0.   0.   0.   2.  -1.   0.   0.   0.  -0.5  0.   0.   0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.  -1.   0.   0.   0.  -1.   4.5 -1.   0.   0.   0.  -1.5  0.   0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.  -1.   0.   0.   0.  -1.   3.5 -1.   0.   0.   0.  -0.5  0.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.  -1.   0.   0.   0.  -1.   4.  -1.   0.   0.   0.  -1.
   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.  -0.5  0.   0.   0.  -1.   2.   0.   0.   0.   0.
  -0.5  0.   0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.  -0.5  0.   0.   0.   0.   2.  -1.   0.   0.
   0.  -0.5  0.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.  -1.5  0.   0.   0.  -1.   4.5 -1.   0.
   0.   0.  -1.   0.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.  -0.5  0.   0.   0.  -1.   3.5 -1.
   0.   0.   0.  -1.   0.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.  -1.   0.   0.   0.  -1.   4.
  -1.   0.   0.   0.  -1.   0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.  -0.5  0.   0.   0.  -1.
   2.   0.   0.   0.   0.  -0.5  0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.  -0.5  0.   0.   0.
   0.   2.  -1.   0.   0.   0.  -0.5  0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.  -1.   0.   0.
   0.  -1.   4.  -1.   0.   0.   0.  -1.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.  -1.   0.
   0.   0.  -1.   4.  -1.   0.   0.   0.  -1.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.  -1.
   0.   0.   0.  -1.   4.  -1.   0.   0.   0.  -1.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  -0.5  0.   0.   0.  -1.   2.   0.   0.   0.   0.  -0.5]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
   0.  -0.5  0.   0.   0.   0.   1.  -0.5  0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
   0.   0.  -1.   0.   0.   0.  -0.5  2.  -0.5  0.   0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
   0.   0.   0.  -1.   0.   0.   0.  -0.5  2.  -0.5  0. ]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
   0.   0.   0.   0.  -1.   0.   0.   0.  -0.5  2.  -0.5]
 [ 0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
   0.   0.   0.   0.   0.  -0.5  0.   0.   0.  -0.5  1. ]]

The load vector (b)=
 [[0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]
 [0.]]

The nodes are:
 [[ 0.   0. ]
 [ 1.   0. ]
 [-1.   0. ]
 [ 0.   1. ]
 [ 0.  -1. ]
 [-1.  -1. ]
 [ 1.  -1. ]
 [ 1.   1. ]
 [-1.   1. ]
 [-0.5  1. ]
 [ 0.5  1. ]
 [-1.   0.5]
 [ 0.   0.5]
 [ 1.   0.5]
 [-0.5  0. ]
 [ 0.5  0. ]
 [-1.  -0.5]
 [ 0.  -0.5]
 [ 1.  -0.5]
 [-0.5 -1. ]
 [ 0.5 -1. ]
 [ 0.5  0.5]
 [-0.5 -0.5]
 [ 0.5 -0.5]
 [-0.5  0.5]]

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The total number of nodes =  25
The total number of elements =  32

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 the solution u(x)=
 [[0.84129809]
 [0.74792449]
 [0.50907033]
 [0.26501986]
 [0.23050492]
 [0.85564429]
 [0.6444924 ]
 [0.42446982]
 [0.28379866]
 [0.28639057]
 [0.80542845]
 [0.59946885]
 [0.43230481]
 [0.32670233]
 [0.34746005]
 [0.62792944]
 [0.55985367]
 [0.46678185]
 [0.40032017]
 [0.38799966]
 [0.58658198]
 [0.54523452]
 [0.47464877]
 [0.41979684]
 [0.40389825]]
```
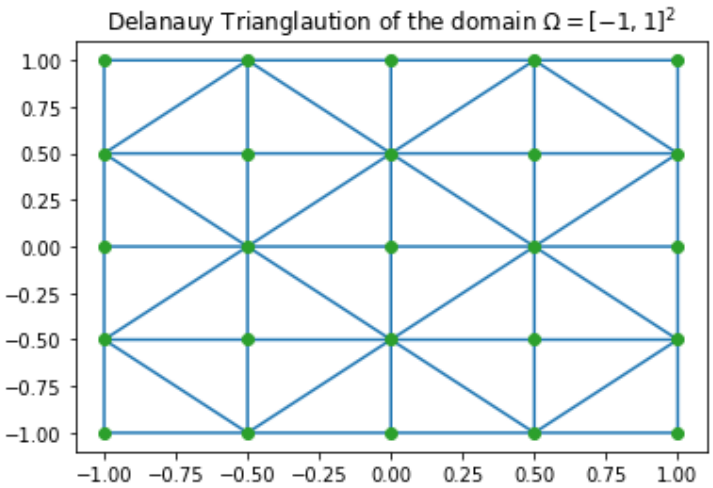
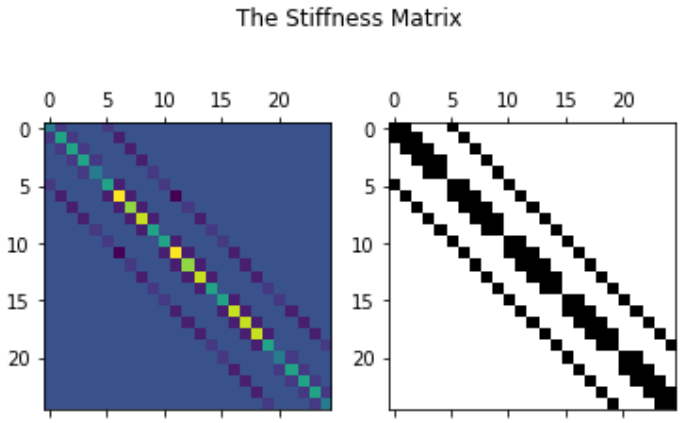
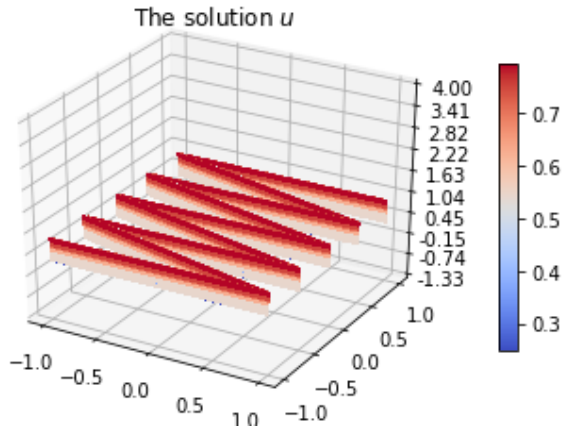
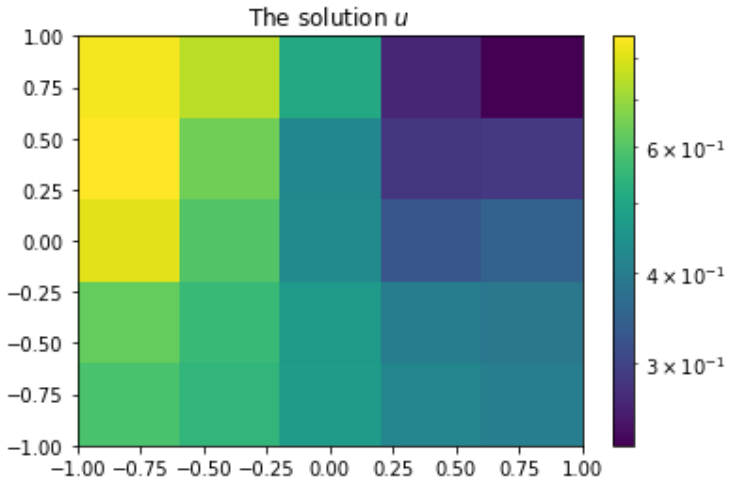




The Stiffness Matrix
0
5
10
15
20


The solution u
4.00
3.41
2.82
2.22
1.63
1.04
0.45
-0.15
-0.74
-1.33
0.7
0.6
0.5
0.4
0.3
−1.0
−0.5
0.0
0.5
1.0


The solution u
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
6×10^{-1}
4×10^{-1}
3×10^{-1}

In [2]: