.markdown-body {
h1 {
font-size: 0.3em;
}
}

platform

python 3.7 + numpy

how to run

```
# question 2 (a)
python LUdcmp.py

# question 2 (b)
python LUbksub.py

# question 3
python SolutionOfNonlinear.py
```

result

question 2 (a)

```
(python37) ➜ Assignment4 git:(master) ✗ python LUdcmp.py
========================= PA = LU ===========================
============================ A ==============================
[[ 41  97 -32  47  23]
 [ 11   2  -5   6  48]
 [ -3   4  55 -61   0]
 [  1   0  17  29 -21]
 [ -6   9  -4  -8  50]]
============================ L ==============================
[[ 1.          0.          0.          0.          0.        ]
 [ 0.26829268  1.          0.          0.          0.        ]
 [-0.07317073 -0.46192893  1.          0.          0.        ]
 [ 0.02439024  0.09847716  0.32085981  1.          0.        ]
 [-0.14634146 -0.96548223 -0.09613084 -0.27798852  1.        ]]
============================ U ==============================
[[ 41.          97.         -32.          47.          23.        ]
 [  0.         -24.02439024   3.58536585  -6.6097561   41.82926829]
```

```
 [  0.           0.          54.31472081 -60.6142132   21.00507614]
 [  0.           0.           0.          47.95323364 -32.41988785]
 [  0.           0.           0.           0.          86.75814793]]
============================ P ==============================
[[0. 0. 0. 1. 0.]
 [1. 0. 0. 0. 0.]
 [0. 0. 1. 0. 0.]
 [0. 1. 0. 0. 0.]
 [0. 0. 0. 0. 1.]]
```

question 2 (b)

```
(python37) → Assignment4 git:(master) ✗ python LUbksub.py
========== b1 ===========
[  4   0  -7  -2 -11]
x =
[ 0.75298185 -0.33646234 -0.09445695 -0.029507   -0.08135663]
========== b2 ===========
[    2    77 -1003    -7    10]
x =
[ -4.25621123  -5.14986926 -10.61709553   6.74145742   0.84549666]
```

question 3

```
accuracy: 5e-05
max_iterations: 5000
============== Bisection ==============
iterations      f(x)    interval
0 -0.6214672120713155 (-2, 0.0)
1 -0.6214672120713155 (-2, -1.0)
2 -0.6214672120713155 (-2, -1.5)
3 -0.1770092842391747 (-1.75, -1.5)
4 -0.1770092842391747 (-1.75, -1.625)
5 -0.04631241249471757 (-1.6875, -1.625)
6 -0.04631241249471757 (-1.6875, -1.65625)
7 -0.012888776863841989 (-1.671875, -1.65625)
8 -0.012888776863841989 (-1.671875, -1.6640625)
9 -0.004493925415704592 (-1.66796875, -1.6640625)
10 -0.0002909715684586145 (-1.666015625, -1.6640625)
11 -0.0002909715684586145 (-1.666015625, -1.6650390625)
12 -0.0002909715684586145 (-1.666015625, -1.66552734375)
13 -0.0002909715684586145 (-1.666015625, -1.665771484375)
14 -2.8166520335354273e-05 (-1.6658935546875, -1.665771484375)
15 -2.8166520335354273e-05 (-1.6658935546875, -1.66583251953125)
16 -2.8166520335354273e-05 (-1.6658935546875, -1.665863037109375)
================= MRF =================
iterations      f(x)    interval
0 -0.10752720097073523 (-1.7164621341554152, 2)
```

```
1 -0.10752720097073523 (-1.7164621341554152, -1.6208695186164095)
2 -0.0010941746032204214 (-1.6663887453924588, -1.6208695186164095)
3 -0.0010941746032204214 (-1.6663887453924588, -1.6653919876159056)
4 -1.1733579768913316e-07 (-1.6658805265087266, -1.6653919876159056)
5 -1.1733579768913316e-07 (-1.6658805265087266, -1.6658804175334931)
=============== Secant ================
iterations      f(x)    x
0 -0.10752720097073426 -1.7164621341554147
1 -0.0046538995996188715 -1.6680431239800497
2 5.9814946690911475e-05 -1.6658526896393049
3 -2.857046424442622e-08 -1.6658804852794598
=============== Newton ================
iterations      f(x)    x
0 0.21138202860592015 -1.5692101008287707
1 0.002033698756811808 -1.6649360653196172
2 4.191525054819678e-07 -1.665880277323402
3 1.790234627208065e-14 -1.6658804720091889
```