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 =
[-9.34322784 -3.31219976 -9.06090234  8.51526649  0.31257907]
```

question 3

```
(python37) ➜ Assignment4 git:(master) ✗ python SolutionOfNonlinear.py


accuracy: 5e-05
max_iterations: 5000
============== Bisection ==============
iterations      f(x)    interval
0 1.0 (0, 0.5)
1 0.2993752444672019 (0.25, 0.5)
2 0.005650518767638002 (0.375, 0.5)
3 0.005650518767638002 (0.375, 0.4375)
4 0.005650518767638002 (0.375, 0.40625)
5 0.005650518767638002 (0.375, 0.390625)
6 0.005650518767638002 (0.375, 0.3828125)
7 0.005650518767638002 (0.375, 0.37890625)
8 0.0014565150512786396 (0.376953125, 0.37890625)
9 0.0014565150512786396 (0.376953125, 0.3779296875)
10 0.0004100534352812213 (0.37744140625, 0.3779296875)
11 0.0004100534352812213 (0.37744140625, 0.377685546875)
12 0.00014856565223586582 (0.3775634765625, 0.377685546875)
13 1.7840910286226475e-05 (0.37762451171875, 0.377685546875)
14 1.7840910286226475e-05 (0.37762451171875, 0.377655029296875)
================= MRF =================
iterations      f(x)    interval
0 1.0 (0, 0.6487532968389234)
1 1.0 (0, 0.4504633147801502)
2 0.06416478342893817 (0.34834856976425976, 0.4504633147801502)
3 0.06416478342893817 (0.34834856976425976, 0.37944062441826343)
4 0.06416478342893817 (0.34834856976425976, 0.3776737273568635)
5 8.338038987287799e-05 (0.37759391070379356, 0.3776737273568635)
6 8.338038987287799e-05 (0.37759391070379356, 0.3776328433449361)
=============== Secant ================
```

```
iterations      f(x)    x
0 -0.4401911888330996 0.6487532968389234
1 3.390337133570412 -0.8786654173121886
2 -0.18836013559373688 0.47322757217694655
3 -0.05130535977181194 0.4020724205516539
4 0.004713027149108484 0.37543605832450505
5 -9.471937755134441e-05 0.3776770706997321
6 -1.66039841875687e-07 0.3776329195998167
=============== Newton ================
iterations      f(x)    x
0 0.09816150750405228 0.3333333333333333
1 0.0030070178671337544 0.37623035615513895
2 3.35854467181651e-06 0.377631273877052
3 4.214295579174632e-12 0.37763284206930914
```