Lab3 - Nikola Uzelac MAT343

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MAT 343 MATLAB Assignment # 3

Question # 1

```
E1 = eye(4);
E1([1,3], :)=E1([3,1],:);

E2 = eye(4);
E2(3,3) = 6;

E3 = eye(4);
E3(2,1)=5;

A = floor(10*rand(4,3))

% This swaped the first and thrid row
E1*A
% This multiplied the third row by 6
E2*A
% This multiplies row one by 5 and row two.
E3*A


A =

     9     0     5
     5     1     0
     0     5     1
     4     6     8


ans =

     0     5     1
     5     1     0
     9     0     5
     4     6     8


ans =
```

```
         9        0        5
         5        1        0
         0       30        6
         4        6        8


ans =

         9        0        5
        50        1       25
         0        5        1
         4        6        8
```

Question 2

```matlab
%(a)

A = [2, -1, 4; 6, 2, 13; -4, 7, 4]

E1 = eye(3);
E1(2,1) = -3
E1*A

E2 = eye(3);
E2(3,1) = 2
E2*A

E3 = eye(3);
E3(3,2) = -1
E3*A

U = E3*E2*E1*A

% (b)

L = E1^-1 * E2^-1 * E3^-1
```

```
A =

     2     -1      4
     6      2     13
    -4      7      4


E1 =

     1      0      0
    -3      1      0
     0      0      1
```

```
ans =

     2    -1     4
     0     5     1
    -4     7     4


E2 =

     1     0     0
     0     1     0
     2     0     1


ans =

     2    -1     4
     6     2    13
     0     5    12


E3 =

     1     0     0
     0     1     0
     0    -1     1


ans =

     2    -1     4
     6     2    13
   -10     5    -9


U =

     2    -1     4
     0     5     1
     0     0    11


L =

     1     0     0
     3     1     0
    -2     1     1
```

Question 3

```
p = [2, 5, 1, 3, 4];
```

```
E = eye(length(p));
E = E(p,:)

A = floor(10*rand(5))

% (a)

% Changed the matrix to row 3, row 1, row 4, row 5, row 2.

E*A

A

% It does column operations on given matrix

A*E

A

%(b)

% They are exactly the same

E^-1

E'
```

```
E =

     0     1     0     0     0
     0     0     0     0     1
     1     0     0     0     0
     0     0     1     0     0
     0     0     0     1     0


A =

     7     6     0     3     1
     0     5     6     8     9
     2     9     7     1     7
     5     0     1     0     2
     6     5     3     2     6


ans =

     0     5     6     8     9
     6     5     3     2     6
     7     6     0     3     1
     2     9     7     1     7
     5     0     1     0     2
```

```
A =

     7     6     0     3     1
     0     5     6     8     9
     2     9     7     1     7
     5     0     1     0     2
     6     5     3     2     6


ans =

     0     7     3     1     6
     6     0     8     9     5
     7     2     1     7     9
     1     5     0     2     0
     3     6     2     6     5


A =

     7     6     0     3     1
     0     5     6     8     9
     2     9     7     1     7
     5     0     1     0     2
     6     5     3     2     6


ans =

     0     0     1     0     0
     1     0     0     0     0
     0     0     0     1     0
     0     0     0     0     1
     0     1     0     0     0


ans =

     0     0     1     0     0
     1     0     0     0     0
     0     0     0     1     0
     0     0     0     0     1
     0     1     0     0     0
```

Question 4

```
A = [4, 1, 2, -3; -3, 3, -1, 4; -1, 2, 5, 1; 5, 4, 3, -1]
b = [-16; 20; -4; -10]

%(a)
[L, U, P] = lu(A)
```

```
P*A
L*U

%(b)
x_lu = (A^(-1))* b

%(c)

x = [-1, 1, -2, 3]'

norm(x_lu - x)


A =

     4     1     2    -3
    -3     3    -1     4
    -1     2     5     1
     5     4     3    -1


b =

   -16
    20
    -4
   -10


L =

    1.0000         0         0         0
   -0.6000    1.0000         0         0
   -0.2000    0.5185    1.0000         0
    0.8000   -0.4074   -0.0143    1.0000


U =

    5.0000    4.0000    3.0000   -1.0000
         0    5.4000    0.8000    3.4000
         0         0    5.1852   -0.9630
         0         0         0   -0.8286


P =

     0     0     0     1
     0     1     0     0
     0     0     1     0
     1     0     0     0


ans =
```

```
    5      4      3     -1
   -3      3     -1      4
   -1      2      5      1
    4      1      2     -3


ans =

    5.0000    4.0000    3.0000   -1.0000
   -3.0000    3.0000   -1.0000    4.0000
   -1.0000    2.0000    5.0000    1.0000
    4.0000    1.0000    2.0000   -3.0000


x_lu =

   -1.0000
    1.0000
   -2.0000
    3.0000


x =

   -1
    1
   -2
    3


ans =

    8.8818e-16
```

Question 5

```
A = rand(500); x = ones(500, 1); b=A*x;

%(a)

tic; R = rref([A, b]); x_rref = R(:,end); toc

%(b)

tic ; [L, U, P] = lu(A); x_lu = (A^(-1))* b; toc

% x_lu factorization method is much faster

%(c)

% Accuracy for x_rref
```

```
norm(x_rref - x)

% Accuracy for x_lu
norm(x_lu - x)
```

Elapsed time is 2.860400 seconds.
Elapsed time is 0.015156 seconds.

ans =

   1.4393e-10

ans =

   2.2139e-10

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