Table of Contents

Question 5

Emmanuel Vargas

```
%create A and b to be solved in part a and b
A = [1,1,2,-5;
     2,5,-1,-9;
     2,1,-1,3;
     1,3,2,7;];
b = [3;-3;-11;-5;];
```

5 A) solve via LU Factorization

```
disp('Question 5 A)')
disp('First we will perform LU Factorization to find L and U...')
%first run the LU Factorization function to get the upper triangular
%and lower triangular
[L, U] = LU_factorization(A);

%display both U and L
disp('After Factorization: ')
disp('We have obtained the upper triangular: ')
disp(U);
disp('We have obtained the lower triangular: ')
disp(L);

%now we have to perform forward substitution to solve Ly = b;
disp('Now run forward substitution to find y by solving Ly = b...');

%find y
y = forward_substitution(L,b);

disp('After running forward substitution we found y: ');
disp(y);

%now we have to perform backward substitution to solve Ux=y
disp('Now run forward substitution to find x by solving Ux = y...')

%find x
x = backward_substitution(U,y);

disp('After running backward substitution we have our final answer
 x:')
disp(x);
```

Question 5 A)
First we will perform LU Factorization to find L and U...
After Factorization:
We have obtained the upper triangular:
```
    1.0000    1.0000    2.0000   -5.0000
         0    3.0000   -5.0000    1.0000
         0         0   -6.6667   13.3333
         0         0         0   18.0000
```

We have obtained the lower triangular:
```
    1.0000         0         0         0
    2.0000    1.0000         0         0
    2.0000   -0.3333    1.0000         0
    1.0000    0.6667   -0.5000    1.0000
```

Now run forward substitution to find y by solving Ly = b...
After running forward substitution we found y:
```
     3
    -9
   -20
   -12
```

Now run forward substitution to find x by solving Ux = y...
After running backward substitution we have our final answer x:
```
   -3.6667
         0
    1.6667
   -0.6667
```

5 B) solve via Gaussian Elimination

```matlab
disp('Question 5 B)')
disp('First we will perform Gaussian Elimination to find U and F...')
%first run the gaussian elimination function to get the upper
 triangular
%and f, the updated b vector
[U, f] = gaussian_elimination(A,b);

%display both U and f
disp('After elimination: ')
disp('We have obtained the upper triangular: ')
disp(U);
disp('We have obtained F, the updated b vector: ')
disp(f);

%now we have to perform back substitution to find x
disp('Now run back substitution to find x...');

%find x
x = backward_substitution(U,f);

disp('After running back substitution we found x: ');
```

```
disp(x);
```

Question 5 B)
First we will perform Gaussian Elimination to find U and F...
After elimination:
We have obtained the upper triangular:
```
    1.0000    1.0000    2.0000   -5.0000
         0    3.0000   -5.0000    1.0000
         0         0   -6.6667   13.3333
         0         0         0   18.0000
```

We have obtained F, the updated b vector:
```
     3
    -9
   -20
   -12
```

Now run back substitution to find x...
After running back substitution we found x:
```
   -3.6667
         0
    1.6667
   -0.6667
```

Published with MATLAB® R2020a