MATH 3940 Assignment 1 Solutions - Matlab Fall 2021

Question 2: (a) >> A=[-1 2 2 5 1; 0 3 1 2 1; 1 -4 1 0 -2; 0 5 3 1 1; 3 -6 0 4 3];

```
>> det(A)
ans =  282.0000
>> inv(A)
ans =   -0.4929    1.2234    0.3475   -0.1950    0.0532
        -0.1418    0.5319    0.0496   -0.0993   -0.0638

         0.1738   -0.7766    0.0142    0.4716    0.0532

         0.0638    0.5106    0.1277   -0.2553   -0.0213

         0.1241   -0.8404   -0.4184    0.3369    0.1809
```

(b) >> B=[7 5 9 2 -1]';

```
>> x=A\B

x =     5.3511

        1.9787

       -1.6489

        3.6596

       -6.6064
```

Question 3: (b) Using the Matlab command lu, we find that

```
>> A=[0 0 -1 1; 1 1 -1 2; 1 1 0 3; 1 2 -1 3];

>> [L U P]=lu(A)

L =   1   0   0   0
      1   1   0   0
      1   0   1   0
      0   0  -1   1

U =   1   1  -1   2
      0   1   0   1
      0   0   1   1
      0   0   0   2
```

```
P =     0    1    0    0
        0    0    0    1
        0    0    1    0
        1    0    0    0
```

After finding the L U and P, we have to find PB

```
>> B=[-1 -1 2 1]' ;
 >> PB=P*B;
```

We write this forward substitution program in M file

```
function X=forsub(A,B)
% A is an n x n lower triangular nonsingular matrix and B is n x 1 matrix
n=length(B);
X=zeros(n,1);
X(1)=B(1)/A(1,1);
for k=2:n
  X(k)=(B(k)-A(k,1:k-1)*X(1:k-1))/A(k,k);
end
```

```
>> Y=forsub(L,PB)
Y =
       -1
        2
        3
        2
```

Then we use the backward substitution program in M file

```
>> X=backsub(U,Y)
X =
       -2
        1
        2
        1
```