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n = 3; % the number of equations
A=[5 2 3; -5 1 2; 4 2 1]; %define the 3x3 matrix A
b=[3;1;1]; %define the column vector b
B = [A b] % 3x4 matrix
L = eye(3) % 3x3 identity matrix
P=eye(n) %3x3 matrix for permutation matrix P

for k=1:n-1 % step number (and row to be multiplied)
    display('Step')
    k
    %{
    %%%%Partial pivoting strategy
    [t,r]=max(abs(B(k:n,k))); %stores the maximum absolute value of b_{ik}
    %for i=k,...n
    %r stores the index of the element t
    %row number is offset by k-1
    r=k-1+r;
    %interchange row (B(k,:)) and row (B(r,:)) of B
    B([k r],:)=B([r k],:);
    %interchange row (P(k,:)) and row (P(r,:)) of P
    P([k r],:)=P([r k],:);
    %interchange L(k,1:k-1) and L(r,1:k-1)
    L([k r],1:k-1)=L([r k],1:k-1);
    %%%%%%%%%end of partial pivoting strategy
    %}
    for i=k+1:n %row number to be changed
        L(i,k)=B(i,k)/B(k,k); % this is the multiplier
        B(i,:)= B(i,:)-L(i,k)*B(k,:) % row operation
    end
    display('Matrix after the k-th elimination step is ')
    B

end

display('Upper triangular matrix U= ')
U=B(:,1:n) %Upper triangular matrix U

display('Lower triangular matrix L= ')
L %Lower triangular matrix L

display('LU=')
L*U

%perform backward substitution
x=B(:,n+1);
x(n)=B(n,n+1)/B(n,n);
for i=n-1:-1:1
    x(i)=(B(i,n+1)-B(i,i+1:n)*x(i+1:n))/B(i,i);
end
%solution
display('The computed solution is x=')
x

```

B =

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

L =

1	0	0
0	1	0
0	0	1

P =

1	0	0
0	1	0
0	0	1

Step

k =

1

B =

5	2	3	3
0	3	5	4
4	2	1	1

B =

5.0000	2.0000	3.0000	3.0000
0	3.0000	5.0000	4.0000
0	0.4000	-1.4000	-1.4000

Matrix after the k-th elimination step is

B =

5.0000	2.0000	3.0000	3.0000
0	3.0000	5.0000	4.0000
0	0.4000	-1.4000	-1.4000

Step

k =

2

B =

5.0000	2.0000	3.0000	3.0000
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0	3.0000	5.0000	4.0000
0	0	-2.0667	-1.9333

Matrix after the k-th elimination step is

B =

5.0000	2.0000	3.0000	3.0000
0	3.0000	5.0000	4.0000
0	0	-2.0667	-1.9333

Upper triangular matrix U=

U =

5.0000	2.0000	3.0000
0	3.0000	5.0000
0	0	-2.0667

Lower triangular matrix L=

L =

1.0000	0	0
-1.0000	1.0000	0
0.8000	0.1333	1.0000

LU=

ans =

5	2	3
-5	1	2
4	2	1

The computed solution is x=

x =

0.1290
-0.2258
0.9355