

Solution 8: 5 of 8 tests passed (50%)

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1 function [L, U, P] = luFactor(A)
2 % luFactor(A)
3 %   LU decomposition with pivoting
4 % inputs:
5 %   A = coefficient matrix
6 % outputs:
7 %   L = lower triangular matrix
8 %   U = upper triangular matrix
9 %   P = the permutation matrix
10
11 [n m] = size(A);
12 if n~=m
13     error("Not a square matrix");
14 end
15
16 P = [1 0 0; 0 1 0; 0 0 1];
17 %PIVOTING ROWS BASED ON GREATEST ABS VALUE
18 if abs(A(1,1)) > abs(A(2,1)) && abs(A(1,1)) > abs(A(3,1))
19     A = A;
20     P = P;
21 end
22
23 if abs(A(2,1)) > abs(A(1,1)) && abs(A(2,1)) > abs(A(3,1))
24     A = [A(2,1) A(2,2) A(2,3); A(1,1) A(1,2) A(1,3); A(3,1) A(3,2) A(3,3)];
25     P = [0 0 1; 0 1 0; 1 0 0];
26 end
27
28 %FIRST AND SECOND STEPS OF GAUSS ELIMINATION
29 a1 = A(2,1) / A(1,1);
30 a2 = A(3,1) / A(1,1);
31
32 eq1A = [A(1,1) A(1,2) A(1,3)];
33 eq2A = (a1.*[A(1,1) A(1,2) A(1,3)]) - [A(2,1) A(2,2) A(2,3)];
34 eq3A = (a2.*[A(1,1) A(1,2) A(1,3)]) - [A(3,1) A(3,2) A(3,3)];
35
36 U1 = [eq1A; eq2A; eq3A];
37
38 %THIRD STEP OF GAUSS ELIMINATION
39 a3 = (a2*A(1,2)-A(3,2)) / (a1*A(1,2)-A(2,2));
40 eq4A = (a3.*[U1(2,1) U1(2,2) U1(2,3)]) - ([U1(3,1) U1(3,2) U1(3,3)]);
41
42 U = [eq1A; eq2A; eq4A];
43 L = [1 0 0; a1 1 0; a2 a3 0];
44 P = P;
45
46
47
48
49 end
```