**Code:**

% MP 3 Nicholas Fong

% Ax = b, or LUx = b

a1 = [ 3, 2, -3, 1;

1, -1, 1, -1;

2, -5, 6, 3;

6, -4, 4, 3];

b1 = [ 5;

7;

10;

20];

if det(a1) == 0

printf("Warning: Matrix a1 is singular\n");

end;

[L1, U1] = lu(a1) %factor a1 into triangular matrices

x1Triangle = U1 \ (L1 \ b1); %solve for x1 using the triangular decomposition

x1Normal = a1 \ b1;

printf("x1 solved using triangular decomposition\n");

x1Triangle

printf("x1 solved using built in Octave solver\n");

x1Normal

printf("----------------------------------------\n");

a2 = [ 1, 1, 1, -1;

3, -1, 1, 2;

1, -1, 2, 1;

2, 3, 1, -1];

b2 = [ 2;

12;

9;

7];

if det(a2) == 0

printf("Warning: Matrix a2 is singular\n");

end;

[L2, U2] = lu(a2) %factor a2 into triangular matrices

x2Triangle = U2 \ (L2 \ b2); %solve for x2 using the triangular decomposition

x2Normal = a2 \ b2;

printf("x2 solved using triangular decomposition\n");

x2Triangle

printf("x2 solved using built in Octave solver\n");

x2Normal

**Output:**

>> MP3

L1 =

0.50000 1.00000 0.00000 0.00000

0.16667 -0.08333 1.00000 0.00000

0.33333 -0.91667 -1.00000 1.00000

1.00000 0.00000 0.00000 0.00000

U1 =

6.00000 -4.00000 4.00000 3.00000

0.00000 4.00000 -5.00000 -0.50000

0.00000 0.00000 -0.08333 -1.54167

0.00000 0.00000 0.00000 0.00000

warning: matrix singular to machine precision, rcond = 1.43483e-017

warning: called from

MP3 at line 15 column 12

warning: matrix singular to machine precision, rcond = 9.30932e-018

warning: called from

MP3 at line 16 column 10

x1 solved using triangular decomposition

x1Triangle =

-1.1676e+015

-7.6728e+015

-6.1716e+015

3.3360e+014

x1 solved using built in Octave solver

x1Normal =

3.26173

-0.99435

0.52629

-1.71764

----------------------------------------

L2 =

0.33333 0.36364 0.31579 1.00000

1.00000 0.00000 0.00000 0.00000

0.33333 -0.18182 1.00000 0.00000

0.66667 1.00000 0.00000 0.00000

U2 =

3.00000 -1.00000 1.00000 2.00000

0.00000 3.66667 0.33333 -2.33333

0.00000 0.00000 1.72727 -0.09091

0.00000 0.00000 0.00000 -0.78947

x2 solved using triangular decomposition

x2Triangle =

1.00000

2.00000

3.00000

4.00000

x2 solved using built in Octave solver

x2Normal =

1.00000

2.00000

3.00000

4.00000