MATH 5110: Lab 1a

Problem 1.
(a)

```
A =

     1    -1     2     1
     2    -2     4     1
    -3     3    -6     1


ans =

     1    -1     2     0
     0     0     0     1
     0     0     0     0
```

No solutions.

(b)

```
A =

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


ans =

    1.0000         0         0    0.5000
         0    1.0000         0    0.5000
         0         0    1.0000    0.5000
```

x_1 = x_2 = x_3 = 0.5

(c)

```
A =

     1    -1     2     1
     4    -2     1     1
     2     0    -3    -1


ans =

    1.0000         0   -1.5000   -0.5000
         0    1.0000   -3.5000   -1.5000
         0         0         0         0
```

(x_1,x_2,x_3) = (-0.5, -1.5, 0) + t*(1.5,3.5,1), $-\infty < t < \infty$

Problem 2.

1) Let c = cos 60 = ½ and s = sin 60 = $\sqrt{3}/2$. The equations are
   A: R_2 = T_5 + T_1 c
      R_1 = T_1 s
   B: T_1 c = T_2 c + T_7
      f_1 + T_1 s + T_2 s =0
   C: T_2 s + T_3 s = 0
      T_5 + T_2c = T_6 + T_3c
   D: f_2 + T_7 + T_3 c = T_4 c
      T_3 s + T_4 s = 0
   E: T_4 s = R_3
      T_6 + T_4 c = 0

Matlab with variables in order (R_1, R_2, R_3, T_1, … , T_7): last column is external forces:

```
c=cos(pi/3);
s=sin(pi/3);
f1=100;
f2=1000;


B=[0 1 0 -c 0 0 0 -1 0 0 0;
    1 0 0 -s 0 0 0 0 0 0 0;
    0 0 0 c -c 0 0 0 0 -1 0;
    0 0 0 s s 0 0 0 0 0 -f1;
    0 0 0  0 s s 0 0 0 0 0;
    0 0 0 0  c -c 0 1 -1 0 0;
    0 0 0 0 0 c -c 0 0 1 -f2;
    0 0 0 0 0 s s 0 0 0 0;
    0 0 1 0 0 0 -s 0 0 0 0;
    0 0 0 0 0 0 c 0 1 0 0]
```

Solution is

```
ans =

   1.0e+03 *

   -0.5080   -1.0000    0.4080   -0.5866    0.4711   -0.4711    0.4711   -0.7067   -0.2356   -0.5289
```

(2) f1 =100; use syms f2. Then solution for T_3 is

```
ans =

[ 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, (50*3^(1/2))/3 - f2/2]
```

Solve for T_3 = -1000 to get f2 = 2058.

(3) Use syms f1 and syms f2 to get

```
[ 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, -(3^(1/2)*(f2 + 3^(1/2)*f1))/4]
[ 0, 1, 0, 0, 0, 0, 0, 0, 0, 0,                          -f2]
[ 0, 0, 1, 0, 0, 0, 0, 0, 0, 0,          (3^(1/2)*f2)/4 - f1/4]
[ 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,        - f2/2 - (3^(1/2)*f1)/2]
[ 0, 0, 0, 0, 1, 0, 0, 0, 0, 0,          f2/2 - (3^(1/2)*f1)/6]
[ 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,          (3^(1/2)*f1)/6 - f2/2]
[ 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, -(3^(1/2)*(f1 - 3^(1/2)*f2))/6]
[ 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,  (3^(1/2)*(f1 - 3^(1/2)*f2))/4]
[ 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, (3^(1/2)*(f1 - 3^(1/2)*f2))/12]
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, -(3^(1/2)*(f1 + 3^(1/2)*f2))/6]
```

Set T_3 = -1000 to get

-1000 = f1/2√3 – f2/2