Homework 4, ME3215 Spring 2022

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Matrix math & solution of linear systems

HW4_3: Cable tensions

```
clear; clc;
d=5; %ft
L=sqrt(10^2+d^2); %Length of cable #3

A=[2/sqrt(33) -7/sqrt(158) 0;
  -2/sqrt(33) -3/sqrt(158) d/L;
   5/sqrt(33) 10/sqrt(158) 10/L];

b=[0;0;1000]; % constant vector

%solve for the tensions
T=A\b;

fprintf('The tensions in the cables are:\nT1=%.4f,\nT2=%.4f,\nT3=%.4f
\n',T)
```

```
The tensions in the cables are:
T1=423.2836,
T2=264.6275,
T3=470.7512
```

HW4_4: Loop currents in a circuit

```
clear; clc;

%given voltages
V1=10; V2=20; V3=100; %volts

%given values of resistors
R1=20; R2=10; R3=25; R4=10; R5=30;%ohms

%rearranged equations result in following coef matrix
A=[(R1+R2) -R1 -R2;
    -R1 (R1+R3+R4) -R4;
    -R2 -R4 (R2+R4+R5)];
b=[V1;V2;V3]; %and constant vector
%solve for the currents
i=A\b;
```

```
fprintf('The currents in the circuits are:\ni1=%.2f,\ni2=%.4f,\ni3=
%.4f\n',i)
```

```
The currents in the circuits are:
i1=2.47,
i2=1.7800,
i3=2.8500
```

HW4_5 Singular coefficient matrix (not for grade)

one of these has no solution.

```
clear;clc
```

Sys1 has a solution

```
sys1 =[ 0    -4    -2     2
    3    -2    -4     0
    4    -5    -3     5
    -4     0     4    -4];
b=[4;3;22;-28];

disp('Sys 1 has a solution')
inv(sys1)
det(sys1)
```

```
Sys 1 has a solution

ans =

   -0.4286    0.1429    0.2857    0.1429
   -0.0357   -0.0714   -0.1429   -0.1964
   -0.3036   -0.1071    0.2857    0.2054
    0.1250   -0.2500         0   -0.1875


ans =

  -224
```

```
%solve
x=sys1\b;
%vectorized printing of the results
fprintf('x%d = %3.0f\n',[1 2 3 4;x'])
```

```
x1 =   1
x2 =   2
x3 =  -1
x4 =   5
```

Sys2: this one does not work. Found out by taking inverse of A (also determinant is zero)

```
sys2=sys1; %same matrix, except for one element
sys2(3,2)=2;

disp('Sys 2 does not have a unique solution')
inv(sys2)
det(sys2)
```

```
Sys 2 does not have a unique solution

ans =

   Inf   Inf   Inf   Inf
   Inf   Inf   Inf   Inf
   Inf   Inf   Inf   Inf
   Inf   Inf   Inf   Inf


ans =

     0
```

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