**Exercise 2.1**

1. *2x1 + x2 + 5x3 = -1  
   x1 + 6x3 = 2  
   -6x1 + 2x2 + 4x3 = 3*

=

1. >> C= [2,1,5

1,0,6

-6,2,4]

C =

2 1 5

1 0 6

-6 2 4

>> d=[-1;2;3]

d =

-1

2

3

>> x = C\d

x =

-0.7778

-1.7593

0.4630

1. >> C\*x-d

ans =

1.0e-15 \*

-0.4441

0

0

**Exercise 2.2**

*-10x1 + 4x2 = 0  
15x1 - 6x2 = 0*

>> C=[-10,4

15,-6]

C =

-10 4

15 -6

>> d=[0;0]

d =

0

0

>> x = C\d

Warning: Matrix is singular to working

precision.

x =

NaN

NaN

X2 is a free variable. I got the error message because the system has infinitely many solutions since there is one free variable.

**Exercise 2.3**

>> C=[1 -3 2;-2 6 -4;4 -12 8]

C =

1 -3 2

-2 6 -4

4 -12 8

>> d=[0;0;0]

d =

0

0

0

>> rref([C d])

ans =

1 -3 2 0

0 0 0 0

0 0 0 0

General Solution:

x1-3x2+2x3 = 0

x1 = 3x2-2x3

Two free variables are required: x2 and x3

**Exercise 2.4**

All the columns add up to 1 because this is a closed exchange model where everyone buys from and sells to the central pool with no outside supply and demand. Also, everything produced is consumed.

**Exercise 2.5**

The system of equations came from the table of information. The left hand side of each equation denotes the percentages of what and how much each person consumes from another citizen. The right hand side of each equation denotes the amount (price) that each citizen spends.

**Exercise 2.6**

1. >> C = [0.25 0.15 0.25 0.18 0.20;

0.15 0.28 0.18 0.17 0.05;

0.22 0.19 0.22 0.22 0.10;

0.20 0.15 0.20 0.28 0.15;

0.18 0.23 0.15 0.15 0.50]

C =

0.2500 0.1500 0.2500 0.1800 0.2000

0.1500 0.2800 0.1800 0.1700 0.0500

0.2200 0.1900 0.2200 0.2200 0.1000

0.2000 0.1500 0.2000 0.2800 0.1500

0.1800 0.2300 0.1500 0.1500 0.5000

>> I = eye(5)

I =

1 0 0 0 0

0 1 0 0 0

0 0 1 0 0

0 0 0 1 0

0 0 0 0 1

1. >> d=[0;0;0;0;0]

d =

0

0

0

0

0

>> rref([C-I d])

ans =

1.0000 0 0 0 -0.8025 0

0 1.0000 0 0 -0.5919 0

0 0 1.0000 0 -0.7108 0

0 0 0 1.0000 -0.7520 0

0 0 0 0 0 0

General Solution:

pF = 0.8025pSB

pT = 0.5919pSB

pC = 0.7108pSB

pCM = 0.7520pSB

pSB = Free variable

1. **A.** The highest priced commodity in Matrixville would be Slacker Bob’s moonshine. The lowest price commodity would be the Tailor’s clothes, since it is only 59.19% of the price of Slacker Bob’s moonshine.
2. In order of increasing income: Tailor, Carpenter, Coal Miner, Farmer, Slacker Bob.
3. If Bob makes $40,000 a year, the income for the rest of the citizens are:
   1. PT = 0.5919(40000) = $23,676
   2. PC = 0.7108(40000) = $28,432
   3. PCM = 0.7520(40000) = $30,080
   4. PF = 0.8025(40000) = $32,100
4. No, moonshine is bad for Bob’s liver and eventually he will have liver damage.

**Exercise 2.7**

1. >> L=[0,1/2,1/4,1,1/3

1/3,0,1/4,0,0

1/3,1/2,0,0,1/3

1/3,0,1/4,0,1/3

0,0,1/4,0,0]

L =

0 0.5000 0.2500 1.0000 0.3333

0.3333 0 0.2500 0 0

0.3333 0.5000 0 0 0.3333

0.3333 0 0.2500 0 0.3333

0 0 0.2500 0 0

1. >> I=eye(5)

I =

1 0 0 0 0

0 1 0 0 0

0 0 1 0 0

0 0 0 1 0

0 0 0 0 1

>> d=[0;0;0;0;0]

d =

0

0

0

0

0

>> rref([L-I d])

ans =

1.0000 0 0 0 -6.3333 0

0 1.0000 0 0 -3.1111 0

0 0 1.0000 0 -4.0000 0

0 0 0 1.0000 -3.4444 0

0 0 0 0 0 0

1. All website rankings are dependent on Eleanor’s website ranking, which after running the rref command, is given as a free variable. Because of this, Alan’s, Beth’s, Charlie’s, and Dana’s website rankings are scalars of that of Eleanor’s. Given this, Alan’s website has the highest ranking because his website’s ranking would be 6.3333 times of Eleanor’s. In order of decreasing PageRank: Alan, Charlie, Dana, Beth, and Eleanor.