

1.33 $T_1 = (10 + 20 + T_2 + T_4)/4 \Rightarrow T_1 = 2.5 + 5 + \frac{1}{4}T_2 + \frac{1}{4}T_4$
 $\hookrightarrow T_1 - \frac{1}{4}T_2 + 0T_3 + \frac{1}{4}T_4 = 7.5$
 $T_2 = (20 + 40 + T_1 + T_3)/4 \Rightarrow T_2 = 5 + 10 + \frac{1}{4}T_1 + \frac{1}{4}T_3$
 $\hookrightarrow \frac{1}{4}T_1 + T_2 - \frac{1}{4}T_3 + 0T_4 = 15$
 $T_3 = (30 + 40 + T_2 + T_4)/4 \Rightarrow T_3 = 7.5 + 10 + \frac{1}{4}T_2 + \frac{1}{4}T_4$
 $\hookrightarrow 0T_1 - \frac{1}{4}T_2 + T_3 - \frac{1}{4}T_4 = 17.5$
 $T_4 = (10 + 30 + T_1 + T_3)/4 \Rightarrow T_4 = 2.5 + 7.5 + \frac{1}{4}T_1 + \frac{1}{4}T_3$
 $\hookrightarrow -\frac{1}{4}T_1 + 0T_2 - \frac{1}{4}T_3 + T_4 = 10$

1.34 $T_1 = 20, T_2 = 27.5, T_3 = 30, T_4 = 22.5$

2. a.
$$\begin{matrix} & A & B & C & & D \\ \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} & \cdot & \begin{bmatrix} 0 & 0 \\ 1 & 6 \end{bmatrix} & = & \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} & \cdot & \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} & = & \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} & \neq & \begin{bmatrix} 6 & 0 \\ 0 & 1 \end{bmatrix} \end{matrix}$$

b.
$$\begin{matrix} & A & B & C \\ \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} & \cdot & \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} & = & \begin{bmatrix} a_{11} \times b_{11} + a_{12} \times b_{21} & a_{11} \times b_{12} + a_{12} \times b_{22} \\ a_{21} \times b_{11} + a_{22} \times b_{21} & a_{21} \times b_{12} + a_{22} \times b_{22} \end{bmatrix} \end{matrix}$$

$$\begin{matrix} & B & A & D \\ \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} & \cdot & \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} & = & \begin{bmatrix} b_{11} \times a_{11} + b_{12} \times a_{21} & b_{11} \times a_{12} + b_{12} \times a_{22} \\ b_{21} \times a_{11} + b_{22} \times a_{21} & b_{21} \times a_{12} + b_{22} \times a_{22} \end{bmatrix} \end{matrix}$$

c. my conclusion holds because the dot product ~~is~~ is done with different combinations

4.28 $1.276x_1 + 30.2x_2 = 1 \text{ (Mtu)}$

b.
$$\begin{matrix} & \begin{bmatrix} 27.6 \\ 3100 \\ 250 \end{bmatrix} & \begin{bmatrix} 30.2 \\ 6400 \\ 360 \end{bmatrix} \\ x_1 & & x_2 \end{matrix}$$

```
>> SteamPlant = [ 27.6 30.2 162; 3100 6400 23610; 250 360 1623]
```

```
SteamPlant =
```

```
1.0e+04 *
```

```
0.0027600000000000 0.0030200000000000 0.0162000000000000
```

```
0.3100000000000000 0.6400000000000000 2.3610000000000000
```

```
0.0250000000000000 0.0360000000000000 0.1623000000000000
```

```
>> Y=rref(SteamPlant)
```

```
Y =
```

```

1.0000000000000000 0 3.9000000000000000
0 1.0000000000000000 1.8000000000000000
0 0 0

```

5. a) (wasn't able to find an L that satisfied $A=LU$)

5. a) $U = \begin{bmatrix} 1 & -3 & 5 & 12 & 0 \\ 0 & -3 & -2 & -2 & 2 \\ 0 & 0 & -1 & -2 & 0 \\ 0 & 0 & 0 & 2 & 4 \\ 0 & 0 & 0 & 0 & 2 \end{bmatrix}$ $L = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -2 & 3 & 0 & 0 & 0 \\ 1 & -1 & -1 & 0 & 0 \\ 0 & -2 & 0 & 2 & 0 \\ -3 & 0 & 1 & -1 & 2 \end{bmatrix}$

$L = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -2 & 3 & 0 & 0 & 0 \\ -3 & -1 & -1 & 0 & 0 \\ 0 & -2 & 0 & 2 & 0 \\ 1 & 0 & 1 & -1 & 2 \end{bmatrix}$ $L = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -2 & 3 & 0 & 0 & 0 \\ 1 & -1 & -1 & 0 & 0 \\ 0 & -2 & 0 & 2 & 0 \\ -3 & 1 & 1 & 1 & 2 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & -3 & 5 & 12 & 0 \\ -2 & 9 & -12 & -26 & 2 \\ 1 & -3 & 4 & 8 & -2 \\ 0 & -6 & 4 & 6 & 0 \\ -3 & 6 & -14 & -36 & -2 \end{bmatrix}$ $x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix}$ $b = \begin{bmatrix} 2 \\ 15 \\ 8 \\ -11 \\ -32 \end{bmatrix}$

b)

```
>> A=load('ps1_data.txt')
```

```
A =
```

```

1 -3 5 12 0
-2 9 -12 -26 2
1 -3 4 8 -2
0 -6 4 6 0
-3 6 -14 -36 -2

```

```
>> b1=[2; 3; -1; 5; 7]
```

```
b1 =
```

```
2
```

```

3
-1
5
7
>> b2=[15; 29; 8; 4; -49]
b2 =
    15
    29
     8
     4
   -49
>> b3=[8; -11; 3; -8; -32]
b3 =
     8
    -11
     3
    -8
   -32
>> A1=rref([A b1])
A1 =
    1.0000     0     0     0     0 19.0000
         0    1.0000     0     0     0 -18.6667
         0     0    1.0000     0     0 -47.0000
         0     0     0    1.0000     0 13.5000
         0     0     0     0    1.0000 -2.0000
>> x1=A1(:, 6)
x1 =
    19.0000
   -18.6667
   -47.0000
    13.5000

```

-2.0000

```
>> A2=rref([A b2])
```

A2 =

1.0000	0	0	0	0	175.0000
0	1.0000	0	0	0	-37.6667
0	0	1.0000	0	0	-57.0000
0	0	0	1.0000	0	1.0000
0	0	0	0	1.0000	30.0000

```
>> x2=A2(:, 6)
```

x2 =

175.0000

-37.6667

-57.0000

1.0000

30.0000

```
>> A3=rref([A b3])
```

x3 =

1 0 0 0 0 0

0 1 0 0 0 3

0 0 1 0 0 1

0 0 0 1 0 1

0 0 0 0 1 0



