Lab1

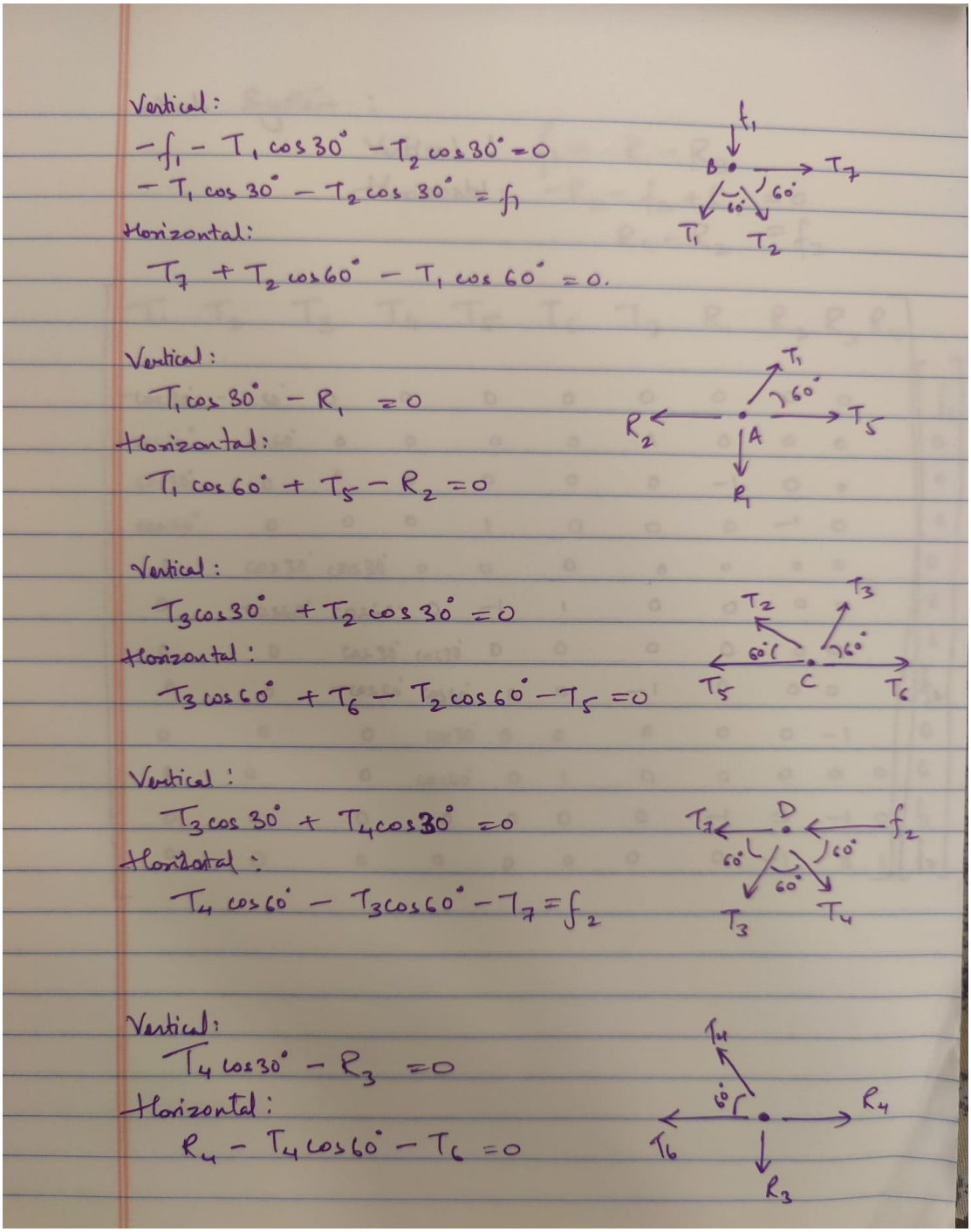
Problem 2.1

(a) We have a non-zero element in rref and this indicates there is no solution for Ax=b. MATLAB's approximation (A\b) yields the following solution.

```
>> Lab1_Problem_2_1
Warning: Matrix is singular to working precision.
> In Lab1_Problem_2_1 (line 4)

Problems 2.1(a)
   NaN
   Inf
   Inf

Problems 2.1(b)
    0.5000
    0.5000
    0.5000

Problems 2.1(c)
         0
   -0.3333
    0.3333
```

Problem 3.1

1. R4 is missing in the question diagram. Included it and solved.



Vertical:

$-f_1 - T_1\cos 30^\circ - T_2\cos 30^\circ = 0$

$-T_1\cos 30^\circ - T_2\cos 30^\circ = f_1$

Horizontal:

$T_7 + T_2\cos 60^\circ - T_1\cos 60^\circ = 0.$

Vertical:

$T_1\cos 30^\circ - R_1 = 0$

Horizontal:

$T_1\cos 60^\circ + T_5 - R_2 = 0$

Vertical:

$T_3\cos 30^\circ + T_2\cos 30^\circ = 0$

Horizontal:

$T_3\cos 60^\circ + T_6 - T_2\cos 60^\circ - T_5 = 0$

Vertical:

$T_3\cos 30^\circ + T_4\cos 30^\circ = 0$

Horizontal:

$T_4\cos 60^\circ - T_3\cos 60^\circ - T_7 = f_2$

Vertical:

$T_4\cos 30^\circ - R_3 = 0$

Horizontal:

$R_4 - T_4\cos 60^\circ - T_6 = 0$

Whole System :

Vertical : $f_1 = -R_1 - R_3$

Horizontal : $-R_2 - f_2 + R_4 = 0$

$R_4 - R_2 = f_2$

T_1	T_2	T_3	T_4	T_5	T_6	T_7	R_1	R_2	R_3	R_4	
$-\cos 30^\circ$	$-\cos 30^\circ$	0	0	0	0	0	0	0	0		f_1
$-\cos 60^\circ$	$\cos 60^\circ$	0	0	0	0	1	0	0	0		0
$\cos 30^\circ$	0	0	0	0	0	0	-1	0	0		0
$\cos 60^\circ$	0	0	0	1	0	0	0	-1	0		0
0	$\cos 30^\circ$	$\cos 30^\circ$	0	0	0	0	0	0	0		0
0	$-\cos 60^\circ$	$\cos 60^\circ$	0	-1	1	0	0	0	0		0
0	0	$\cos 30^\circ$	$\cos 30^\circ$	0	0	0	0	0	0		0
0	0	$-\cos 60^\circ$	$\cos 60^\circ$	0	0	-1	0	0	0		f_2
0	0	0	$\cos 30^\circ$	0	0	0	0	0	-1		0
0	0	0	$\cos 60^\circ$	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	-1	0	-1	0	f_1
0	0	0	0	0	0	0	0	-1	0	1	f_2

$$\begin{pmatrix} T1 \\ T2 \\ T3 \\ T4 \\ T5 \\ T6 \\ T7 \\ R1 \\ R2 \\ R3 \\ R4 \end{pmatrix} = \begin{pmatrix} -430.9401 \\ 315.4701 \\ -315.4701 \\ 315.4701 \\ -473.2051 \\ -157.7350 \\ -684.5299 \\ -373.2051 \\ -688.6751 \\ 273.2051 \\ 311.3249 \end{pmatrix}$$

2.

$$\begin{pmatrix} T1 \\ T2 \\ T3 \\ T4 \\ T5 \\ T6 \\ T7 \\ R1 \\ R2 \\ R3 \\ R4 \end{pmatrix} = \begin{pmatrix} (2 * 3\text{^}(1/2) * \text{f1})/(3 * (3\text{^}(1/2) - 2)) \\ -(2 * (3 * \text{f1} - 3\text{^}(1/2) * \text{f1}))/(3 * (3\text{^}(1/2) - 2)) \\ -2 * \text{f1} - (2 * 3\text{^}(1/2) * \text{f1})/3 \\ (2 * 3\text{^}(1/2) * (\text{f1} - 3\text{^}(1/2) * \text{f1}))/(3 * (3\text{^}(1/2) - 2)) \\ -(3\text{^}(1/2) * (\text{f1} - 3\text{^}(1/2) * \text{f1}))/(3\text{^}(1/2) - 2) \\ -(3\text{^}(1/2) * (\text{f1} - 3\text{^}(1/2) * \text{f1}))/(3 * (3\text{^}(1/2) - 2)) \\ -(6 * \text{f1} - 6 * \text{f2} - 2 * 3\text{^}(1/2) * \text{f1} + 3 * 3\text{^}(1/2) * \text{f2})/(3 * (3\text{^}(1/2) - 2)) \\ \text{f1}/(3\text{^}(1/2) - 2) \\ (9 * \text{f1} - 2 * 3\text{^}(1/2) * \text{f1})/(3 * (3\text{^}(1/2) - 2)) \\ -(3\text{^}(1/2) * (3 * \text{f1} - 3\text{^}(1/2) * \text{f1}))/(3 * (3\text{^}(1/2) - 2)) \\ (9 * \text{f1} - 6 * \text{f2} - 2 * 3\text{^}(1/2) * \text{f1} + 3 * 3\text{^}(1/2) * \text{f2})/(3 * (3\text{^}(1/2) - 2)) \end{pmatrix}$$

It is clearly visible that T3 and f2 are independent, therefore, change in f2 doesn't change T3.

3.

If T3 = 1000 then,

$$-2 * \text{f1} - \frac{2 * 3^{\frac{1}{2}} * \text{f1}}{3} = 1000$$

⇨ f1 ≈ -316.9873

for any value of f2.

1b

```
>> Lab_1b
Problem 2.1
    2.4455   -0.4558   -0.2476   -0.0588
   10.6574   -1.4300   -1.2112   -0.2585
  235.8636  -35.3400  -28.4804   -5.7000
   81.1064  -17.0496   -6.5352   -1.6280

Problem 2.2
    5.1036
   14.8974
   51.1443
 -147.6006
```