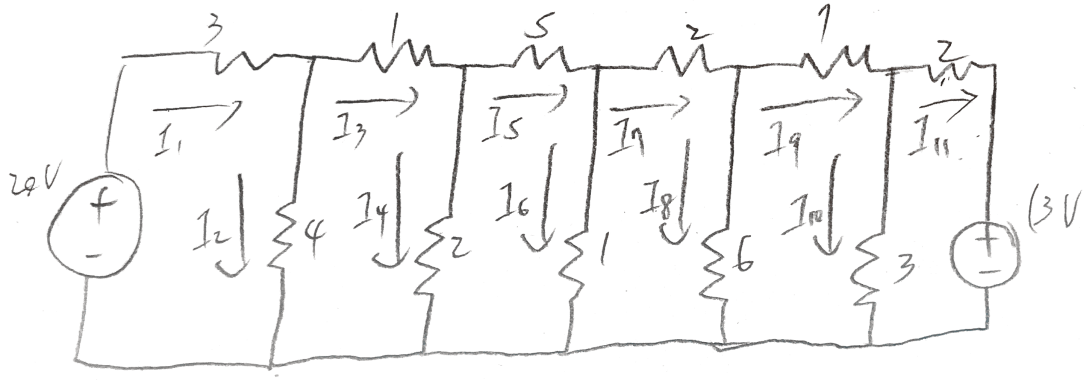
Report of Assignment 3

黃采瑩 106072237

My circuit



Matrix A

$$\begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\ 3 & 4 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 4 & -1 & -2 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & -5 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & -2 & -6 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 6 & -7 & -3 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 3 & -2 \end{bmatrix}$$

KCL Functions

$$I_1 = I_2 + I_3$$
$$I_3 = I_4 + I_5$$
$$I_5 = I_6 + I_7$$
$$I_7 = I_8 + I_9$$
$$I_9 = I_{10} + I_{11}$$

KVL Functions

$$3I_1 + 4I_2 = 20$$
$$4I_2 - I_3 - 2I_4 = 0$$
$$2I_4 - 5I_5 - I_6 = 0$$
$$I_6 - 2I_7 - 6I_8 = 0$$
$$6I_8 - 7I_9 - 3I_{10} = 0$$
$$3I_{10} - 2I_{11} = 13$$

Matrix b

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 20 \\ 0 \\ 0 \\ 0 \\ 0 \\ 13 \end{bmatrix}$$

A^{-1}

$$\begin{bmatrix} 2.63 & -5.74 & 4.53 & -1.41 & -2.91 & 2.46 & -3.11 & -2.43 & -4.78 & -2.43 & -1.46 \\ -1.97 & 4.31 & -3.4 & 1.06 & 2.18 & 6.57 & 2.33 & 1.82 & 3.58 & 1.82 & 1.09 \\ 9.34 & 1.43 & -1.13 & 3.51 & 7.28 & -3.11 & 7.78 & 6.07 & 1.19 & 6.07 & 3.64 \\ -8.61 & 7.9 & -6.23 & 1.93 & 4 & 2.87 & -7.18 & 3.34 & 6.56 & 3.34 & 2 \\ -7.28 & 6.67 & 7.36 & -2.29 & -4.73 & 2.43 & -6.07 & -3.94 & -7.75 & -3.94 & -2.37 \\ -1.36 & 1.24 & -4.93 & 1.53 & 3.17 & 4.53 & -1.13 & -7.36 & 5.19 & 2.64 & 1.58 \\ 1.43 & -1.31 & 5.19 & -1.3 & -2.69 & -4.77 & 1.19 & 7.75 & -4.41 & -2.24 & -1.35 \\ -7.04 & 6.45 & -2.55 & 6.89 & 1.42 & 2.34 & -5.86 & -3.81 & 2.17 & 1.19 & 7.13 \\ -7.28 & 6.67 & -2.64 & 7.13 & 1.27 & 2.43 & -6.07 & -3.94 & 2.24 & 1.06 & 6.34 \\ 2.91 & -2.67 & 1.06 & -2.85 & -1.07 & -9.7 & 2.43 & 1.58 & -8.98 & -4.23 & -5.36 \\ 4.37 & -4 & 1.58 & -4.28 & -1.6 & -1.46 & 3.64 & 2.37 & -1.35 & -6.34 & -5.8 \end{bmatrix}$$

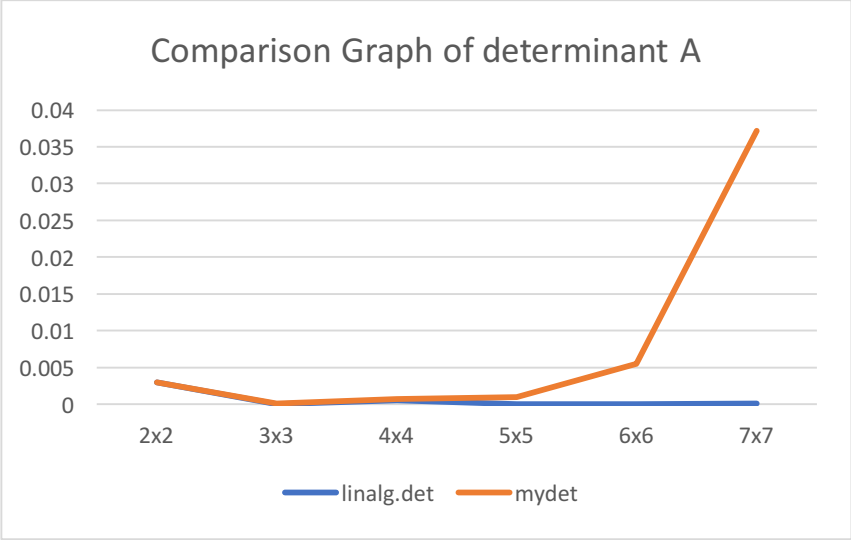
x

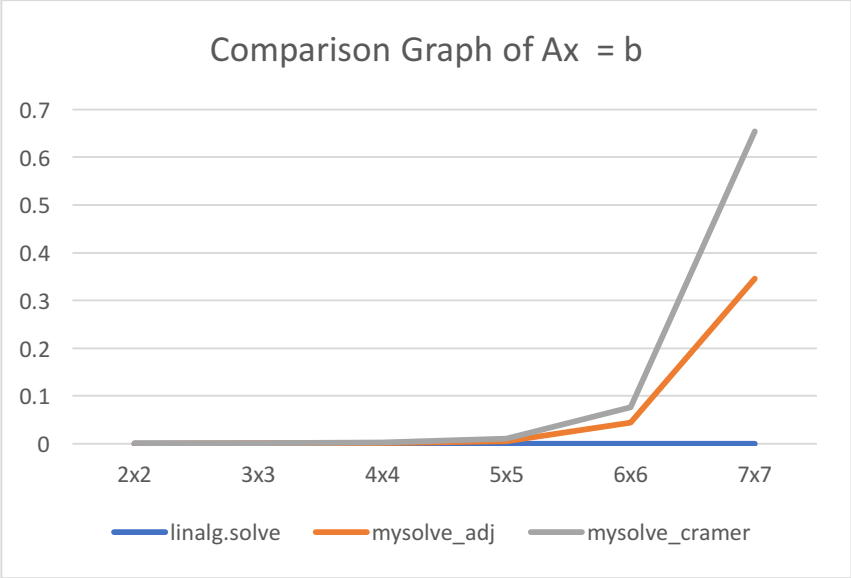
$$\begin{bmatrix} 3 \\ 2 \\ -5 \\ 8 \\ -2 \\ 29 \\ -27 \\ 13 \\ 13 \\ -2 \\ -10 \end{bmatrix}$$

Running time(seconds)

linalg.solve	mysolve_adj	mysove_cramer
0:00:00.129178	0:38:46.532642	0:39:23.633191

Relation between running time and size of matrix





Size of matrix	linalg.det	mydet	linalg.solve	mysolve_adj	mysove_cramer
2x2	0:00:00.002966	0:00:00.000014	0:00:00.000088	0:00:00.000068	0:00:00.000139
3x3	0:00:00.000042	0:00:00.000047	0:00:00.000080	0:00:00.000298	0:00:00.000311
4x4	0:00:00.000541	0:00:00.000192	0:00:00.000044	0:00:00.001182	0:00:00.001240
5x5	0:00:00.000033	0:00:00.000949	0:00:00.000078	0:00:00.005116	0:00:00.004563
6x6	0:00:00.000052	0:00:00.005443	0:00:00.000087	0:00:00.043685	0:00:00.032542
7x7	0:00:00.000071	0:00:00.037102	0:00:00.000080	0:00:00.346023	0:00:00.307476

Conclusion

While computing determinant of A, the bigger the matrix is, the more time mydet required to generate the answer. On the other hand, linalg.det isn’t doing the same as mydet, the time it took merely had a difference.

The bigger the matrix is, the longer running time of the answer required. Among all the way of calculation, numpy.linalg.solve is the fastest, then mysolve_adj, the slowest is mysolve_cramer.