Homework 5, PHYS 272 (Methods of Applied Physics)
Spring 2020
Due Friday, February 7th, 2020

As always, turn your legible and complete answers in on separate paper. Remember, I can't give partial credit unless I can follow what you've done. Including words is usually a good thing for you.

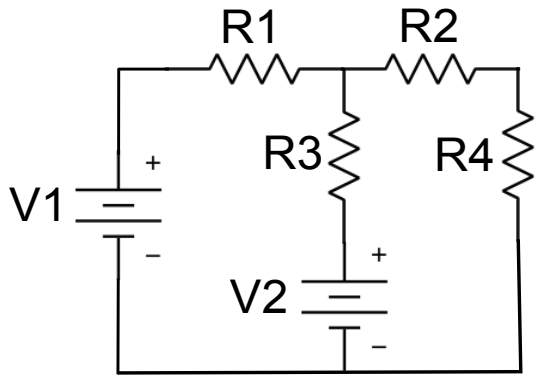
1. *By hand* (no computers), solve the following system of linear equations via Gaussian elimination:

$$\begin{aligned} -2x + y - 3z &= 1 \\ 2x - 2y + z &= -3 \\ x + y - z &= -3 \end{aligned}$$

2. *By hand*, solve the following system of linear equations by using Gaussian elimination:

$$\begin{aligned} -2x - 6y + 9z &= 4 \\ 5x + 4y - 3z &= 24 \\ x - 8y - 24z &= 19 \end{aligned}$$

3. Consider the circuit below. (Hint – there's a reason we're doing this right after we talked about row reduction. You may need to get a refresher on the use of Kirchhoff's Circuit Laws)



   a) Find the current through $R3$. (Hint – there's a reason we're doing this right after we talked about row reduction. You may need to get a refresher on the use of Kirchhoff's Circuit Laws) Hint; you don't necessarily need to know about the current everywhere to get the current through $R3$. Even just finding the one current, it gets kinda messy.

   b) Let $V_1 = V_2 = V$, and let $R_1 = R_2 = R_3 = R_4 = R$. Simplify your answer in part (a) to show that, in this case, the current through R_3 is given by $|I| = \frac{V}{5R}$.

4. Define the following matrices as follows:

$$A = \begin{pmatrix} -1 & 3 \\ 2 & -3 \end{pmatrix} \qquad B = \begin{pmatrix} 4 & -6 \\ -1 & 7 \end{pmatrix} \qquad C = \begin{pmatrix} y^2 & z^4 \\ x^2y^2 & yz \end{pmatrix}$$

a) Find [A,A]

b) Find [A,B]

c) Find [B,A]

d) Find [B,C]

5. Find the inverse of the following matrix:

$$\begin{pmatrix} 2 & 0 & 2 \\ 4 & 2 & 2 \\ 4 & 2 & 4 \end{pmatrix}$$