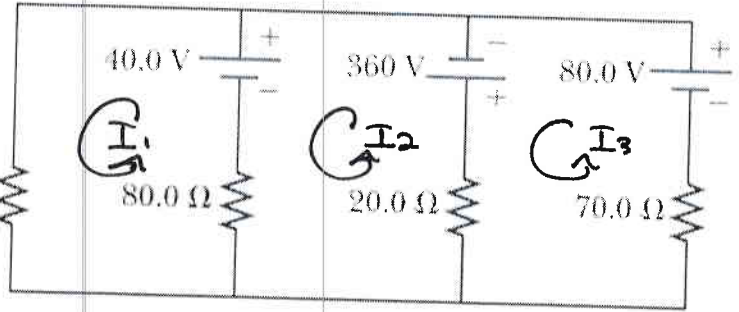


**Instructions:** Show all work. Answers must be justified in some fashion to received credit, even if you use your calculator. Given exact answers unless specifically asked to round.

1. For the loop current graph shown below, write the system of equations that solves for the current in each loop. Then solve the system. You may round your answers to 2 significant digits.



$$280 I_1 - 80 I_2 = 40$$

$$-80 I_1 + 100 I_2 - 20 I_3 = -400$$

$$-20 I_2 + 90 I_3 = 440$$

$$\begin{bmatrix} 280 & -80 & 0 \\ -80 & 100 & -20 \\ 0 & -20 & 90 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 40 \\ -400 \\ 440 \end{bmatrix} \Rightarrow \text{rref} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} -1 \\ -4 \\ 4 \end{bmatrix}$$

$$\vec{I} = \begin{bmatrix} -1 \\ -4 \\ 4 \end{bmatrix}$$

2. Perform the indicated operations **by hand** using the following matrices:  $A = \begin{bmatrix} 1 & 5 \\ 2 & 4 \end{bmatrix}$ ,  $B =$

$\begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix}$ ,  $C = \begin{bmatrix} 9 & -4 \\ 1 & 7 \\ 0 & -2 \end{bmatrix}$ ,  $D = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$ . If the operation is not possible, state why.

a.  $A^{-1}B$   $(2 \times 2) \cdot (2 \times 2)$

$$A^{-1} = \frac{1}{6} \begin{bmatrix} 4 & -5 \\ -2 & 1 \end{bmatrix}$$

c.  $DC$   $(3 \times 1) \cdot (3 \times 2)$

$$A^{-1}B = \frac{1}{6} \begin{bmatrix} 13 & -15 \\ -5 & 3 \end{bmatrix} = \begin{bmatrix} -13/6 & 5/2 \\ 5/6 & -1/2 \end{bmatrix} \text{ not defined}$$

b.  $-2A + 3B$   $(2 \times 2) \cdot (2 \times 2)$

$$\begin{bmatrix} -2 & -10 \\ -4 & -8 \end{bmatrix} + \begin{bmatrix} 6 & 0 \\ -3 & 9 \end{bmatrix} = \begin{bmatrix} 4 & -10 \\ -7 & 1 \end{bmatrix}$$

d.  $BC$   $(2 \times 2) \cdot (3 \times 2)$    
 not defined