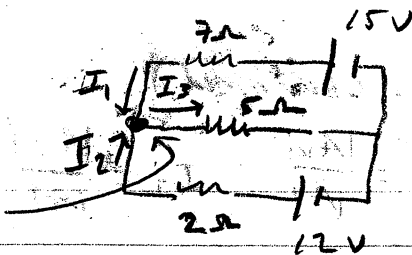


Apply Cramer's Rule
to this simple circuit.

KIRCHOFF
JUNCTION
HERE



By Kirchoff's Rule:

$$I_1 + I_2 = I_3$$

$$-15 + 7I_1 + 5I_3 = 0$$

$$-12 + 2I_2 + 5I_3 = 0$$

$$I. \quad I_1 + I_2 - I_3 = 0$$

$$II. \quad 7I_1 + 0I_2 + 5I_3 = 15 \text{ V}$$

$$III. \quad 0I_1 + 2I_2 + 5I_3 = 12$$

$$\begin{bmatrix} 1 & 1 & -1 & 0 \\ 7 & 0 & 5 & 15 \\ 0 & 2 & 5 & 12 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 1 & -1 \\ 7 & 0 & 5 \\ 0 & 2 & 5 \end{bmatrix}$$

$$A_x = \begin{bmatrix} 0 & 1 & -1 \\ 15 & 0 & 5 \\ 12 & 2 & 5 \end{bmatrix}$$

$$A_y = \begin{bmatrix} 1 & 0 & -1 \\ 7 & 15 & 5 \\ 0 & 12 & 5 \end{bmatrix}$$

$$A_z = \begin{bmatrix} 1 & 1 & 0 \\ 7 & 0 & 15 \\ 0 & 2 & 12 \end{bmatrix}$$

$$|A| = 1 \begin{vmatrix} 0 & 5 \\ 2 & 5 \end{vmatrix} - 1 \begin{vmatrix} 7 & 5 \\ 0 & 5 \end{vmatrix} + (-1) \begin{vmatrix} 7 & 0 \\ 0 & 2 \end{vmatrix} = 1(0-10) - 1(35-0) - 1(14-0) = -10 - 35 - 14 = -59$$

$$|A_x| = 0 \begin{vmatrix} 0 & 5 \\ 12 & 5 \end{vmatrix} - 1 \begin{vmatrix} 15 & 5 \\ 12 & 5 \end{vmatrix} + (-1) \begin{vmatrix} 15 & 0 \\ 12 & 2 \end{vmatrix} = 0 - 1(75-60) - 1(30-0) = -15 - 30 = -45$$

$$|A_y| = 1 \begin{vmatrix} 15 & 5 \\ 12 & 5 \end{vmatrix} - 0 \begin{vmatrix} 7 & 15 \\ 0 & 12 \end{vmatrix} + (-1) \begin{vmatrix} 7 & 15 \\ 0 & 12 \end{vmatrix} = 1(75-60) - 0 - 1(84-0) = 15 - 84 = -69$$

$$|A_z| = 1 \begin{vmatrix} 0 & 5 \\ 2 & 12 \end{vmatrix} - 1 \begin{vmatrix} 7 & 15 \\ 0 & 12 \end{vmatrix} + 0 \begin{vmatrix} 7 & 15 \\ 0 & 12 \end{vmatrix} = 1(0-30) - 1(84-0) + 0 = -114$$

$$I_1 = \frac{|A_x|}{|A|} = \frac{-45}{-59} = \boxed{0.763 \text{ A}} = 763 \text{ mA}$$

$$I_2 = \frac{|A_y|}{|A|} = \frac{-69}{-59} = \boxed{1.17 \text{ A}}$$

$$I_3 = \frac{|A_z|}{|A|} = \frac{-114}{-59} = \boxed{1.92 \text{ A}}$$

- W.F.

[NB: All I, V and R in 3 sig. fig.]