4. For the following circuit, using KCL, find:

1. \( V_A \)
2. \( V_B \)
3. Power dissipated by the voltage source
4. Power dissipated by the current source

\[ R_2 = 1 \text{ ohm} \]
\[ R_1 = \text{ let this be } R_1 \]

\[ V = 5 \text{ V} \]

\[ I_1 = \frac{5 - V_A}{4} \]
\[ I_2 = \frac{V_A - V_B}{16} \]
\[ I_3 = \frac{V_B}{8} \]

**KCL** current entering = current leaving

Write currents in terms of voltages

\[ I_1 = I_2 + \frac{8}{16} \]
\[ 4(5 - V_A) = V_A - V_B + 128 \]
\[ 20 - 4V_A = V_A - V_B + 128 \]
\[ -108 - 5V_A = -V_B \]

\[ V_B = 5V_A + 108 \]

Node A

\[ 8 + I_2 = I_3 \]
\[ 8 + \frac{V_A - V_B}{16} = \frac{V_B}{8} \]
\[ 128 + V_A - V_B = 2V_B \]
\[ 3V_B = 128 + V_A \]
\[ V_B = \frac{128 + V_A}{3} \]

Set two equations for \( V_B \) equal

\[ \left( \frac{5V_A + 108 = 128 + V_A}{3} \right) \]
\[ 15V_A + 324 = 128 + V_A \]
\[ 14V_A = -196 \rightarrow V_A = -14 \text{ V} \]

Solve for \( V_B \):

\[ V_B = 5V_A + 108 \]
\[ V_B = 5(-14) + 108 \]
\[ V_B = 38 \text{ V} \]

**Power dissipated by voltage source**

\[ P = IV \text{ where } I = -I_1 \]
\[ P = (-4.75) S \]
\[ P = -23.75 \text{ W dissipated} \]

**Power dissipated by current source**

\[ P = IV \text{ where } V = V_A - V_B \]
\[ P = 8 (-52) \]
\[ P = -416 \text{ W dissipated} \]