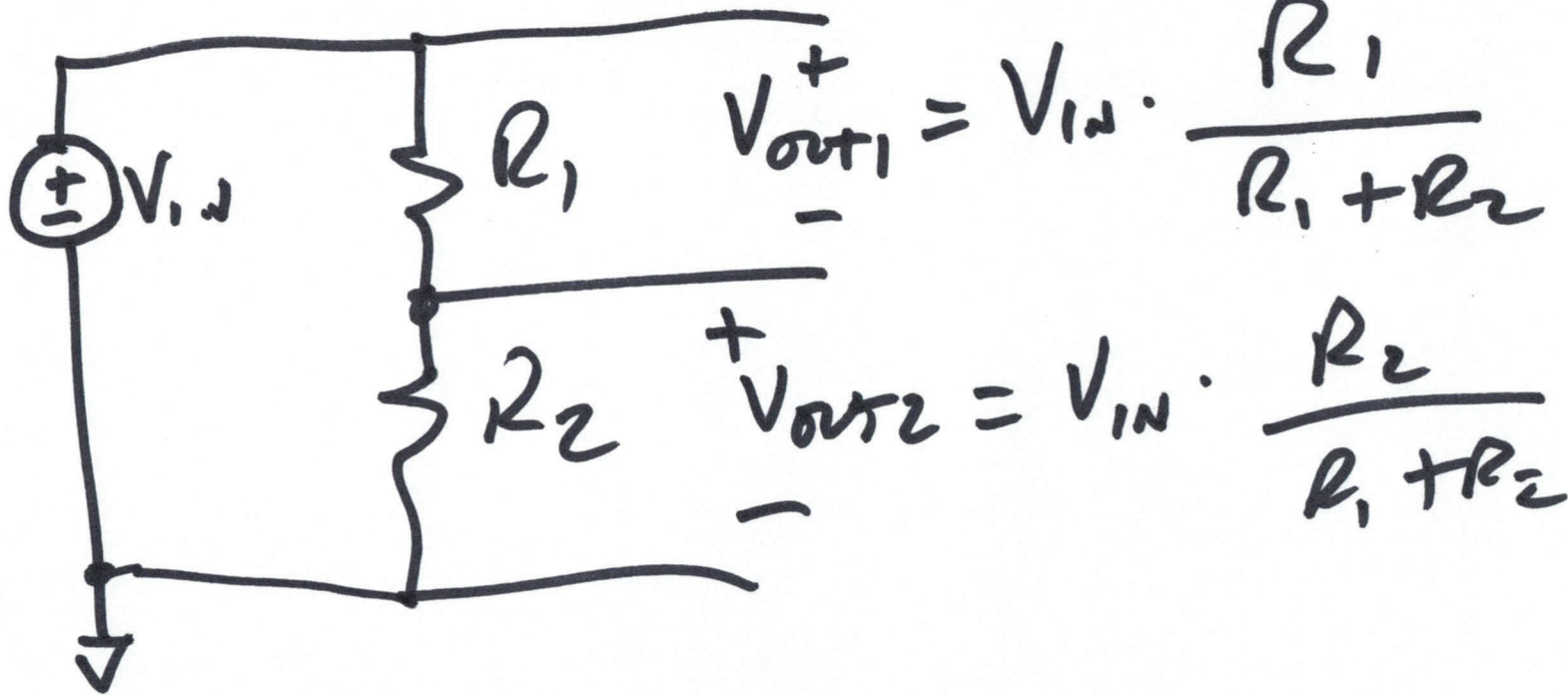
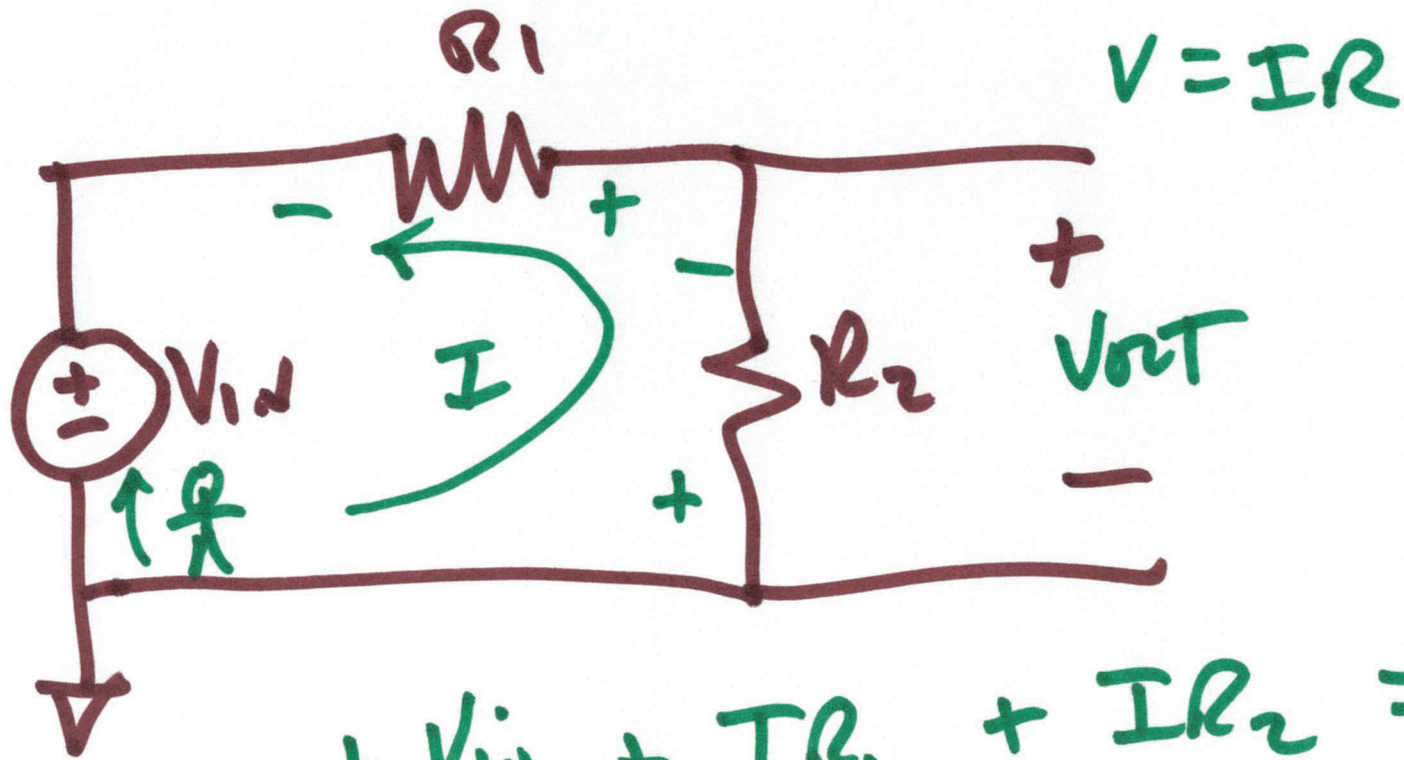


EE 220 Circuits I

Lecture 4

Sept. 12, 2022





$$+V_{in} + IR_1 + IR_2 = 0$$

$$I(R_1 + R_2) = -V_{in} \quad I = \frac{-V_{in}}{R_1 + R_2}$$

~~$$\frac{A \cdot B(c+d)}{A} = \frac{5 \times C}{B(c+d)}$$~~

2)

$$\frac{5 \times 10^6 \cdot X}{4 \cdot 10^3} = \frac{-A(C+D)}{X}$$

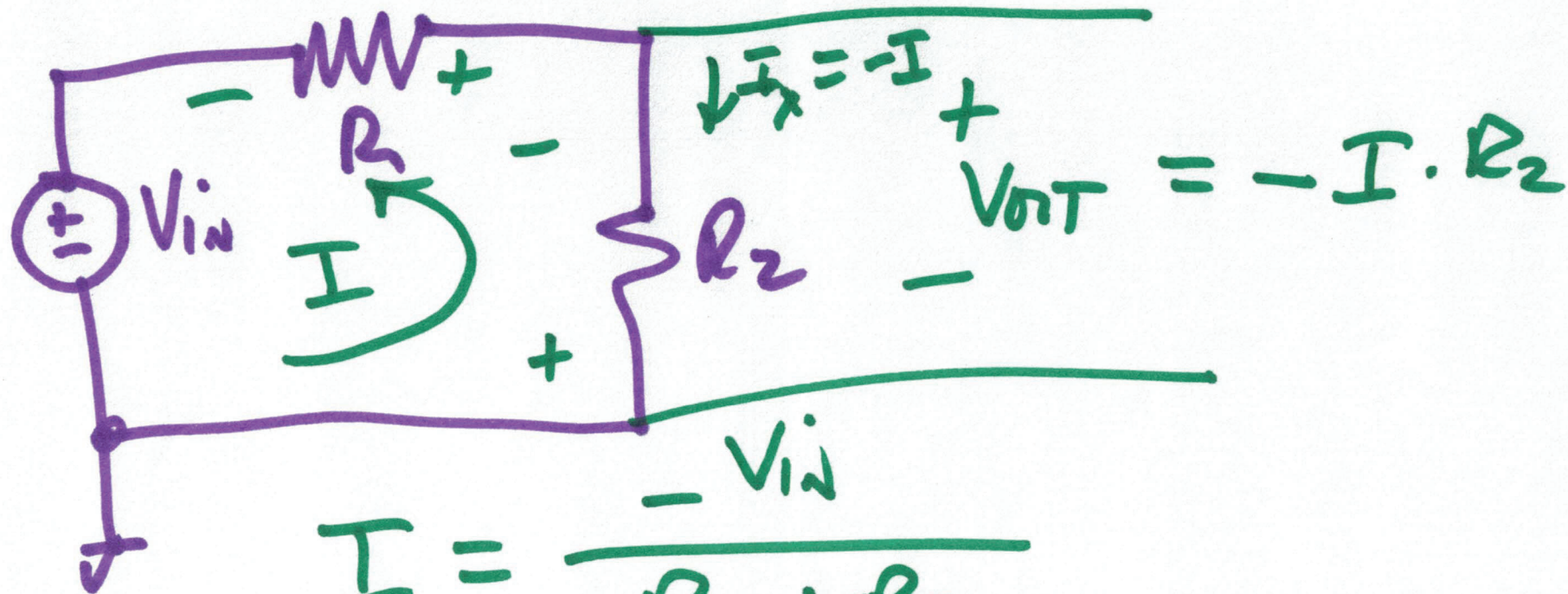
$$\frac{5 \times 10^6 \cdot X^2}{4 \cdot 10^3 (C+D)} = -A$$

$$\frac{a}{-b} = -\frac{a}{b} = \frac{-a}{b}$$

$$C+D = \frac{5 \times 10^6 X^2}{-A \cdot 4 \cdot 10^3}$$

$$C = \frac{5 \times 10^6 X^2}{-A \cdot 4 \cdot 10^3} - D$$

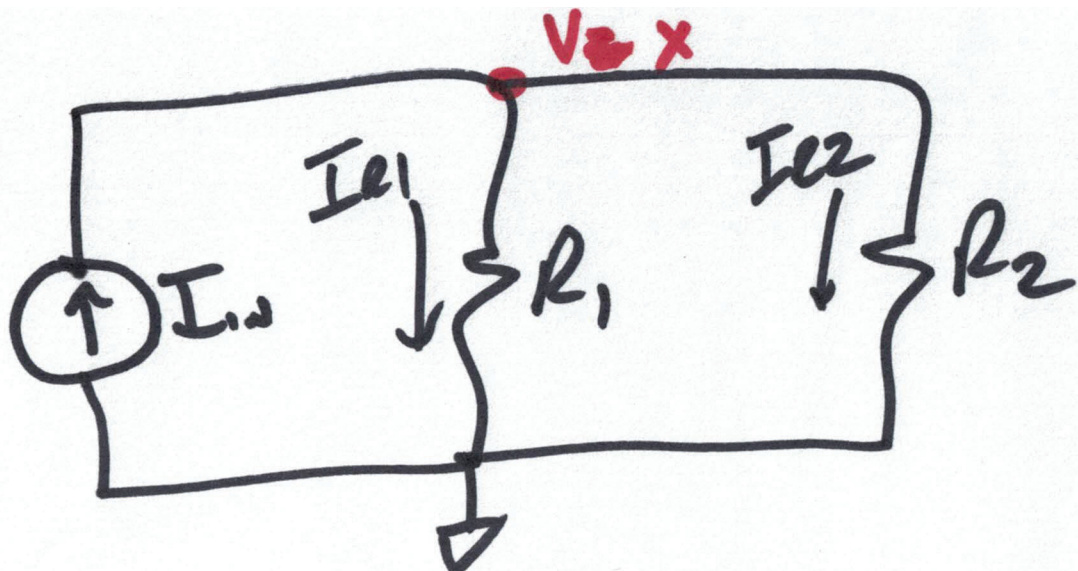
3)



$$I = \frac{-V_{in}}{R_1 + R_2}$$

$$V_{out} = -I \cdot R_2$$

$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2}$$



$$I_{r1} = \frac{I_{in} \cdot R_2}{R_1 + R_2}$$

$$I_{r2} = \frac{I_{in} \cdot R_1}{R_1 + R_2}$$

$$I_{r1} = \frac{V_x}{R_1}$$

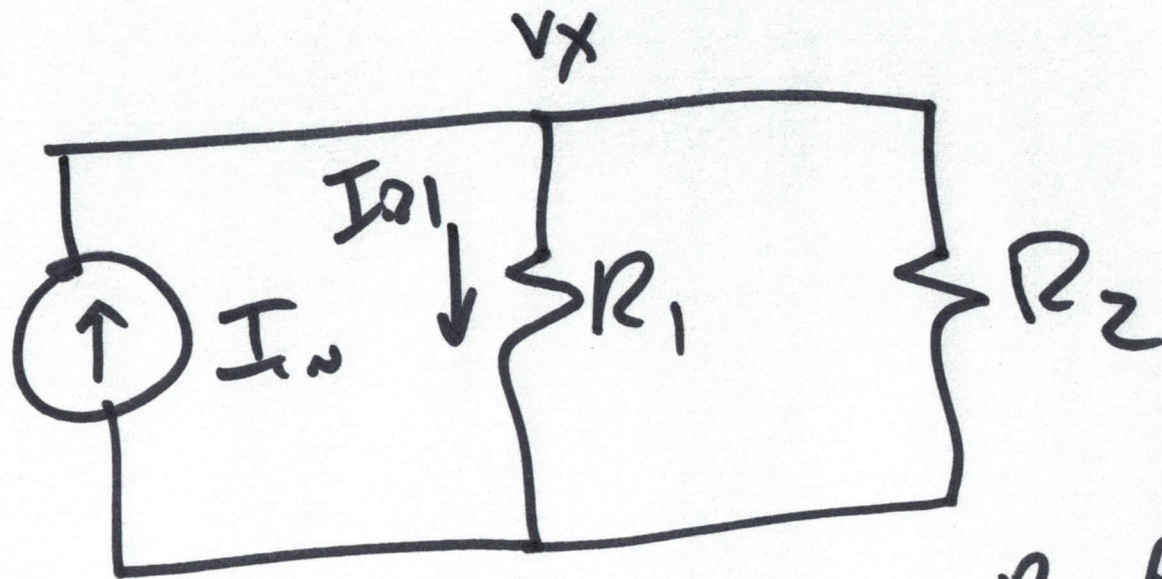
$$I_{r2} = \frac{V_x}{R_2}$$

$$I_{in} = \frac{V_x}{R_1} + \frac{V_x}{R_2} = \frac{V_x}{\frac{R_1 R_2}{R_1 + R_2}}$$

$$= V_x \cdot \left(\frac{R_2 + R_1}{R_2 R_1} \right)$$

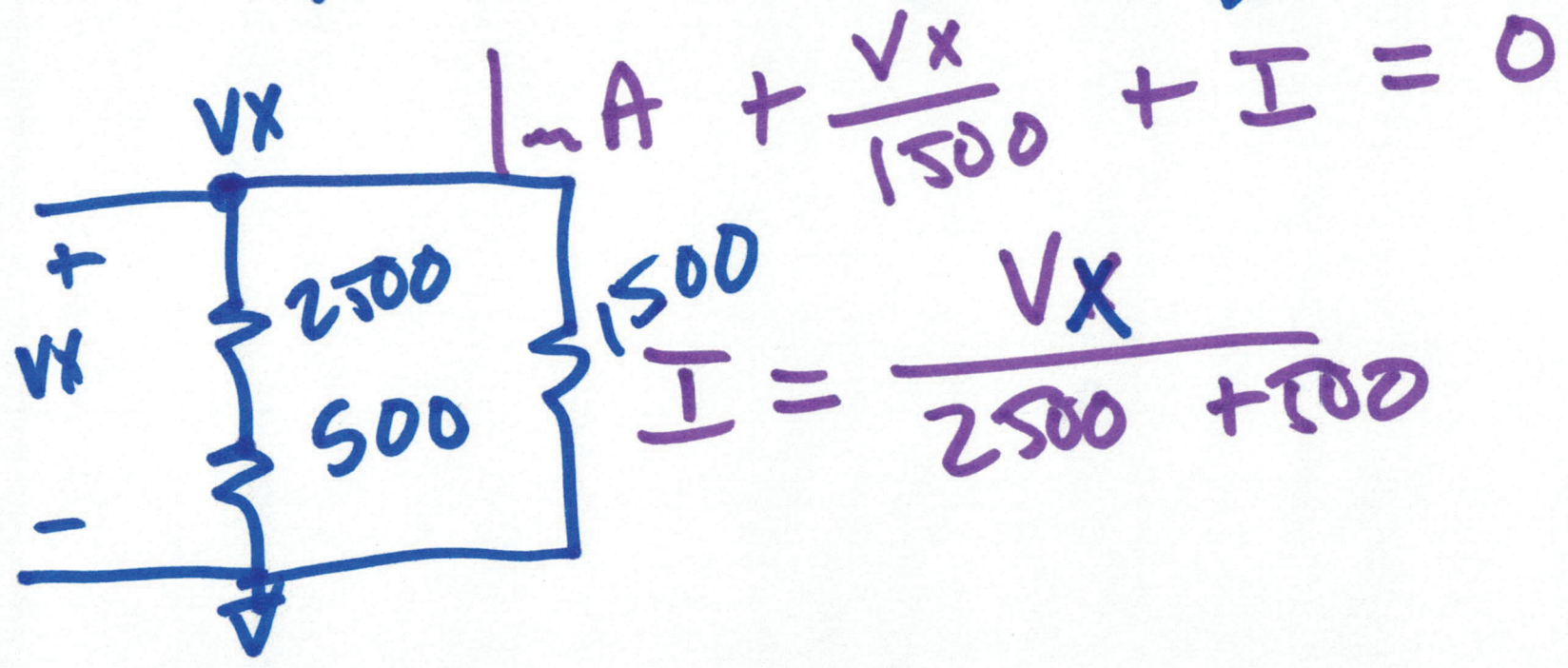
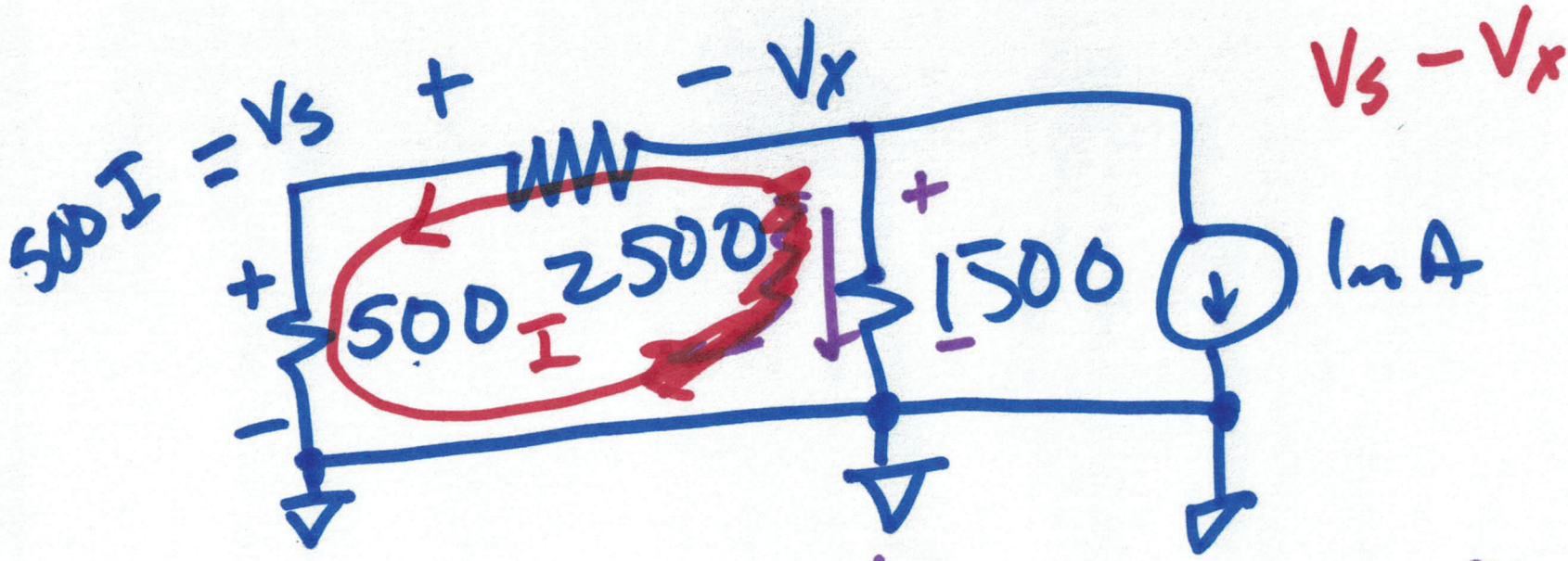
$$= V_x \cdot \left(\frac{R_2 + R_1}{R_1 R_2} \right)$$

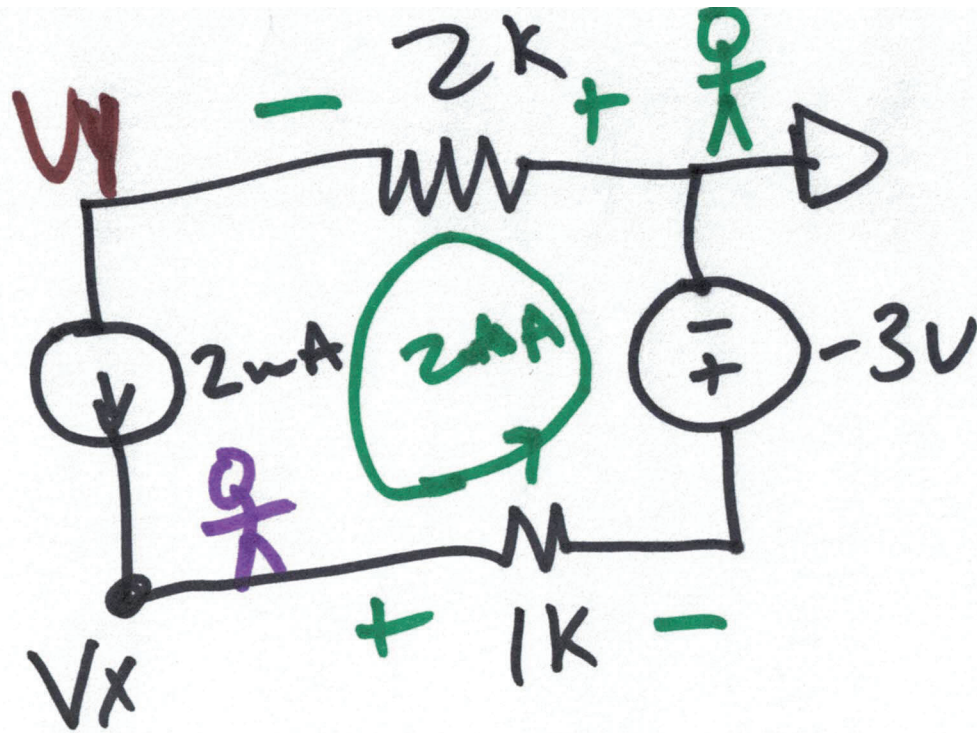
5)



$$V_x = I_n \cdot \frac{R_1 R_2}{R_1 + R_2}$$

$$I_{R1} = \frac{V_x}{R_1} = I_n \cdot \frac{R_2}{R_1 + R_2}$$





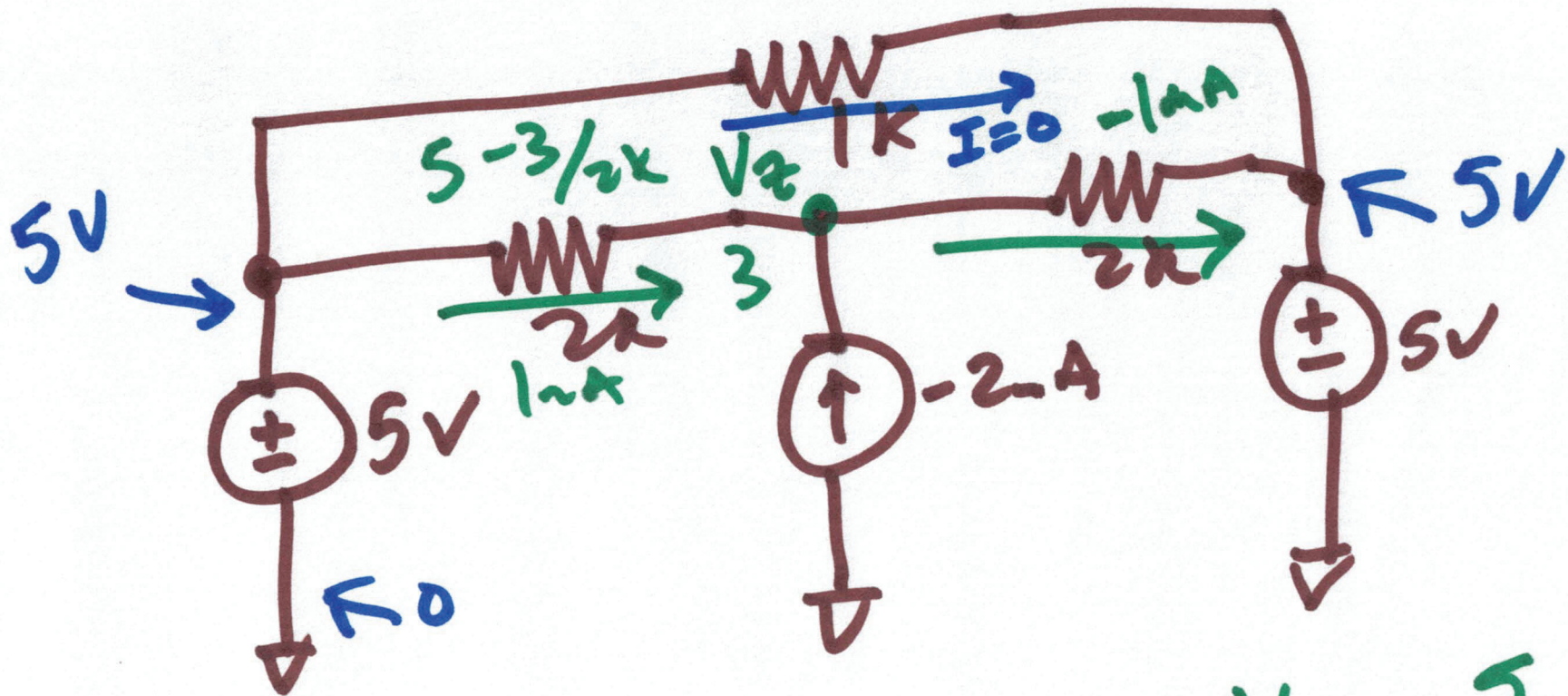
$$+ (-3V) + 2mA \cdot 1K$$

$$= V_x = -3 + 2$$

$$V_x = -1V$$

$$-2k \cdot 2mA = V_y = -4V$$

8)



$$\frac{5 - V_z}{2k} + (-2mA) = \frac{V_z - 5}{2k}$$

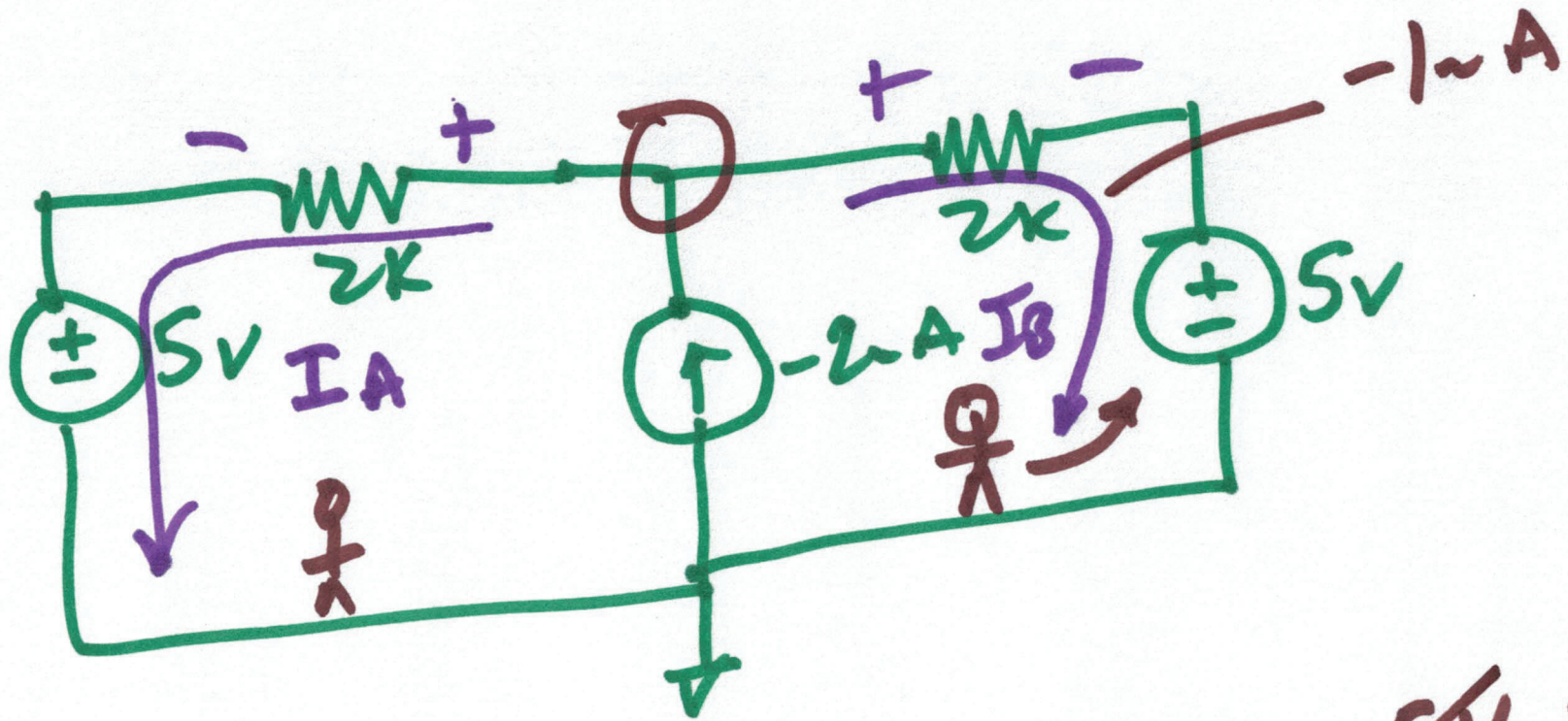
$$5 - V_z - 4V = V_z - 5$$

$$6 = 2V_z$$

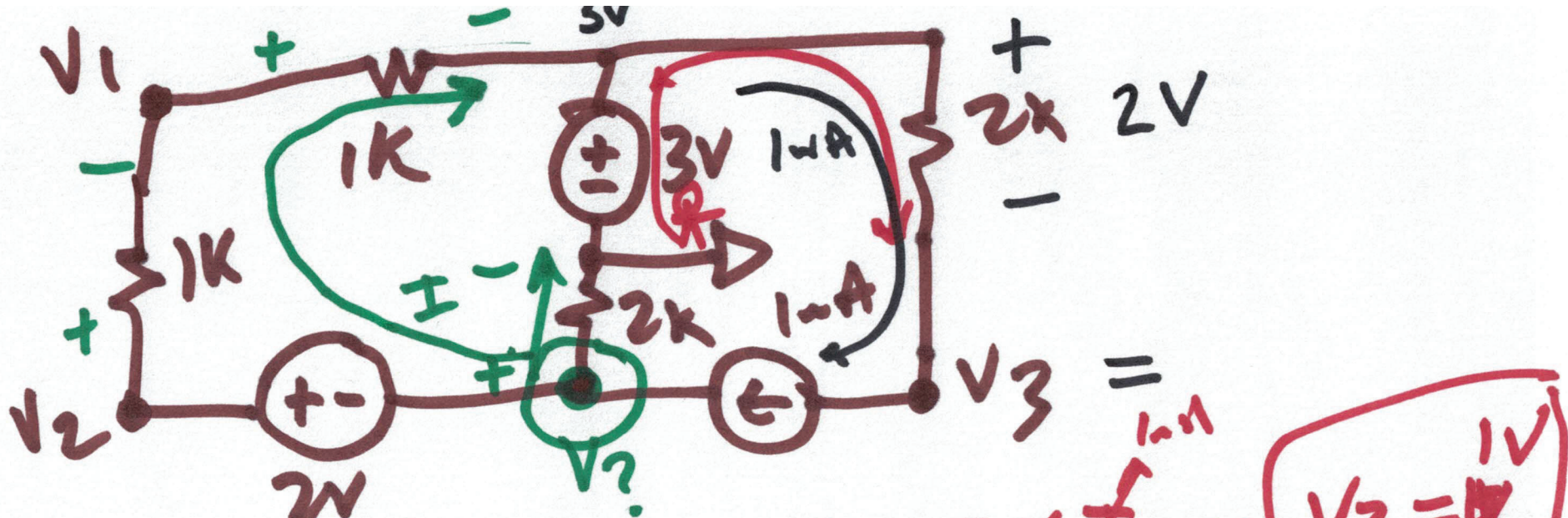
$$V_z = 3$$

CMOSedu.com

9)



$$\begin{aligned}
 & +5V + 2kI_B - 2kI_A - 5V = 0 \\
 & I_A + I_B = -2\mu A \rightarrow I_A = -(2\mu A + I_B) \\
 & \rightarrow 2k(I_B - I_A) = 0 \\
 & 2kI_B + 2k(2\mu A + I_B) = 0 \\
 & 2kI_B + 4 + 2kI_B = 0 \quad I_B = -1\mu A
 \end{aligned}$$

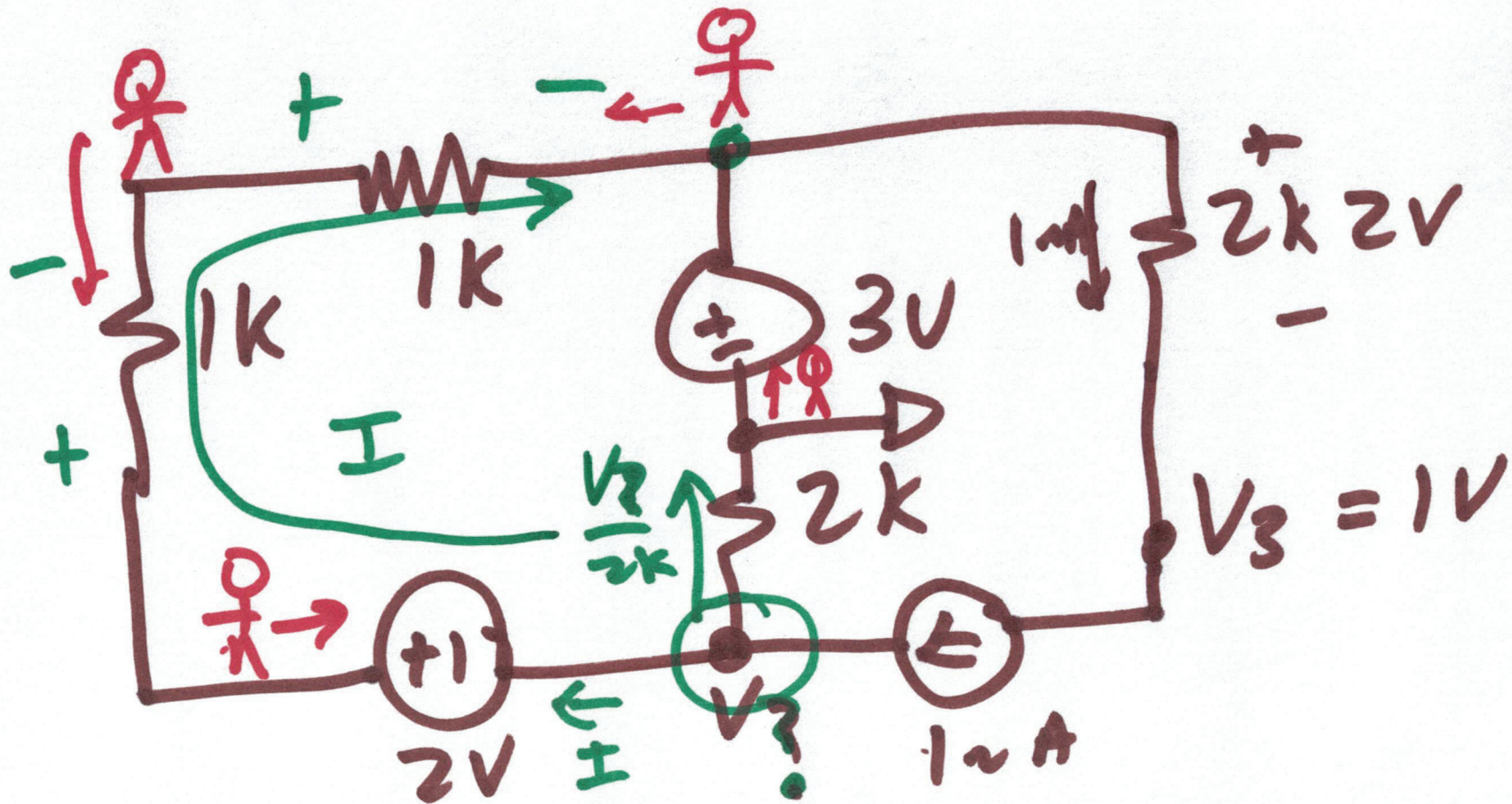


$$1\text{mA} + \frac{V?}{2\text{k}} + I = 0$$

$$+3\text{V} + I \cdot 1\text{k} + I \cdot 1\text{k} - 2\text{V} = V?$$

$$+3 - \underbrace{2\text{k} \cdot I}_{2\text{V}} = \boxed{V_3 = 1\text{V}}$$

~~9/20/20 = 10~~



$$1\text{~A} = I + \frac{V_7}{2k}$$

$$+3V + 1kI + 1kI - 2V = V_7?$$