

1 on 2keV

$$I_4 = \frac{1}{1} = 1 \text{ mA}$$

$$U_{R_1} = I_4 R_1 = 1 \text{ V}$$

$$I_3 = I_4 = 1 \text{ mA}$$

$$U_{R_3} = I_3 \cdot R_3 = 2 \text{ V}$$

$$V_{02} = U_{R_3} + U_{R_1} = 1 + 2 \Rightarrow \boxed{U_{R_3} = 3 \text{ V}}$$

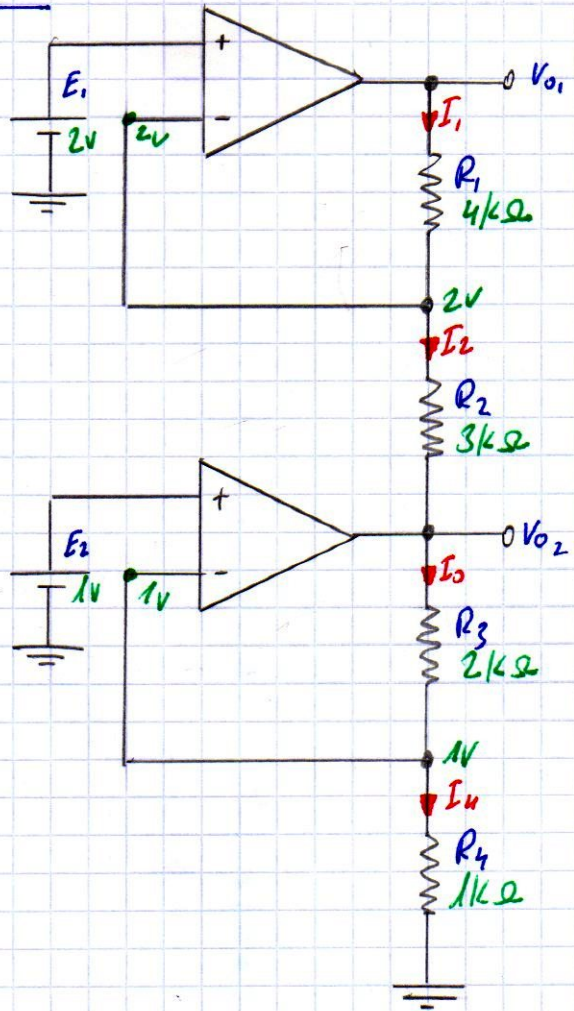
$$U_{R_2} = E_2 - V_{02} = 3 - 2 = -1 \text{ V}$$

$$I_{R_2} = \frac{U_{R_2}}{R_2} = \frac{-1}{3} = -\frac{1}{3} \text{ mA}$$

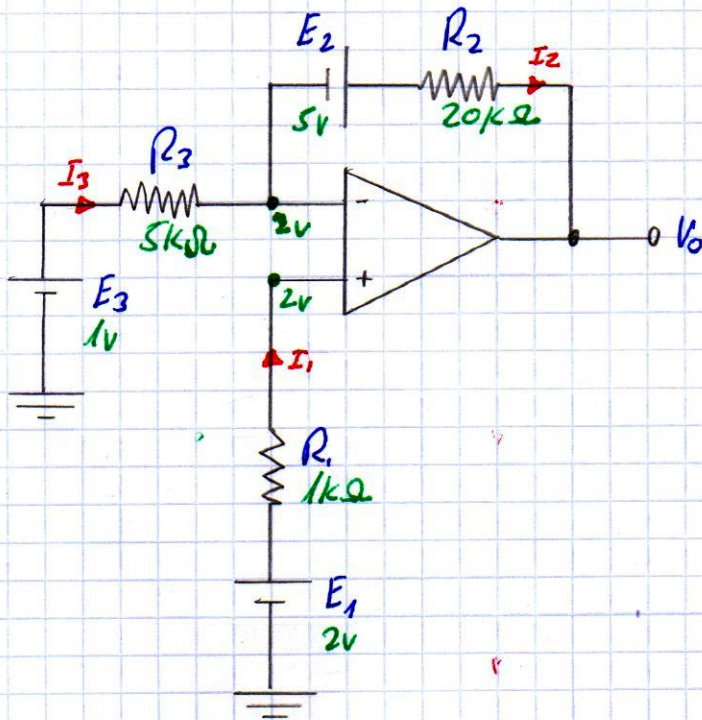
$$I_{R_1} = I_{R_2} = -\frac{1}{3} \text{ mA}$$

$$U_{R_{1,2}} = I_{R_1} \cdot (R_1 + R_2) = -\frac{1}{3} \cdot (4 + 3) = -2.333 \text{ V}$$

$$V_{01} = U_{R_{1,2}} + V_{02} = -2.333 + 3 \Rightarrow \boxed{V_{01} = 0.666 \text{ V}}$$



k2 on - ple

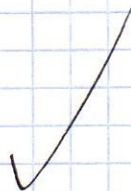


$$I_{R_3} = \frac{2-1}{5} = 0.2 \text{ mA}$$

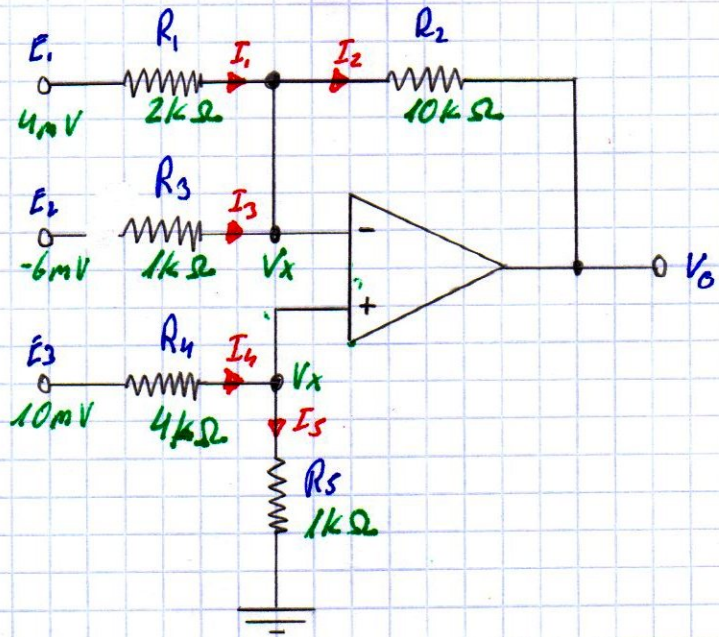
$$I_{R_2} = I_{R_3} = 0.2 \text{ mA}$$

$$U_{R_2} = I_{R_2} \cdot R_2 = 0.2 \cdot 20 = 4 \text{ V}$$

$$V_0 = U_{R_2} + E_2 + E_1 = 4 + 5 + 2 \Rightarrow \boxed{V_0 = 11 \text{ V}}$$



$$\approx 2 \text{ on } 2'ke$$



$$V_x = U_{R_5} = E_3 \cdot \frac{R_4}{R_4 + R_5} = 10 \cdot \frac{1}{4+1} \Rightarrow \boxed{V_x = 2 \text{ mV}}$$

$$I_1 + I_3 = I_2$$

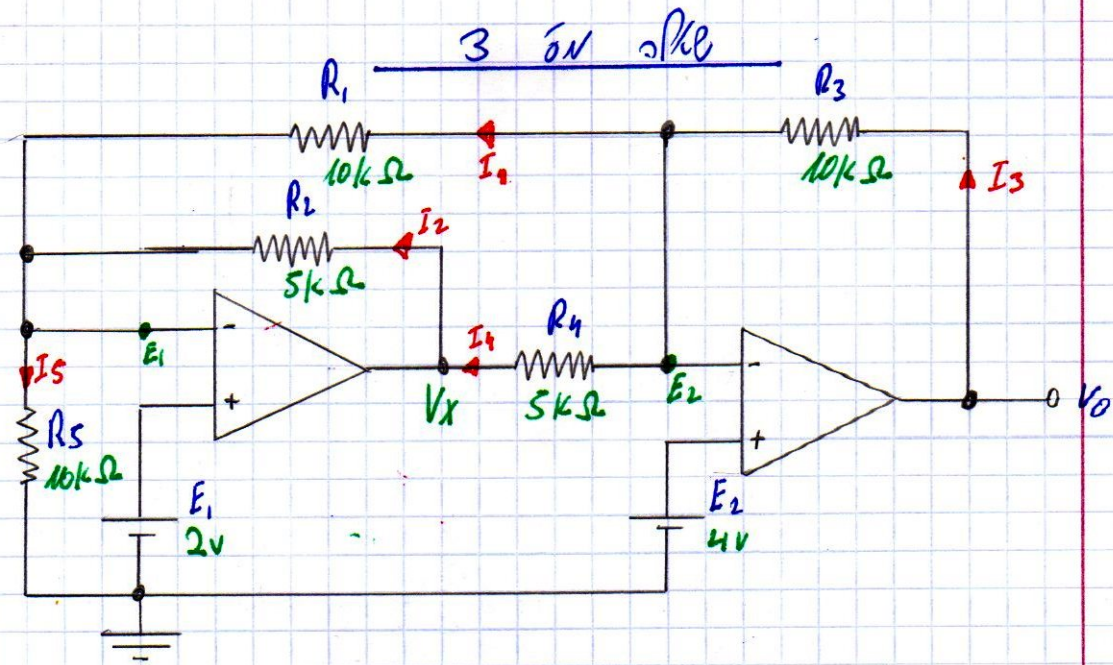
$$\frac{E_1 - V_x}{R_1} + \frac{E_2 - V_x}{R_3} = \frac{V_x - V_0}{R_2}$$

$$\frac{4 - 2}{2} + \frac{-6 - 2}{1} = \frac{2 - V_0}{10}$$

$$1 - 8 = \frac{2 - V_0}{10} \quad | \cdot 10$$

$$10 - 80 = 2 - V_0$$

$$\boxed{V_0 = 72 \text{ mV}}$$



$$I_5 = I_1 + I_2$$

$$I_1 = \frac{E_2 - E_1}{R_1} = \frac{4 - 2}{10} = 0.2 \text{ mA}$$

$$I_5 = \frac{E_1 - 0}{10} = 0.2 \text{ mA}$$

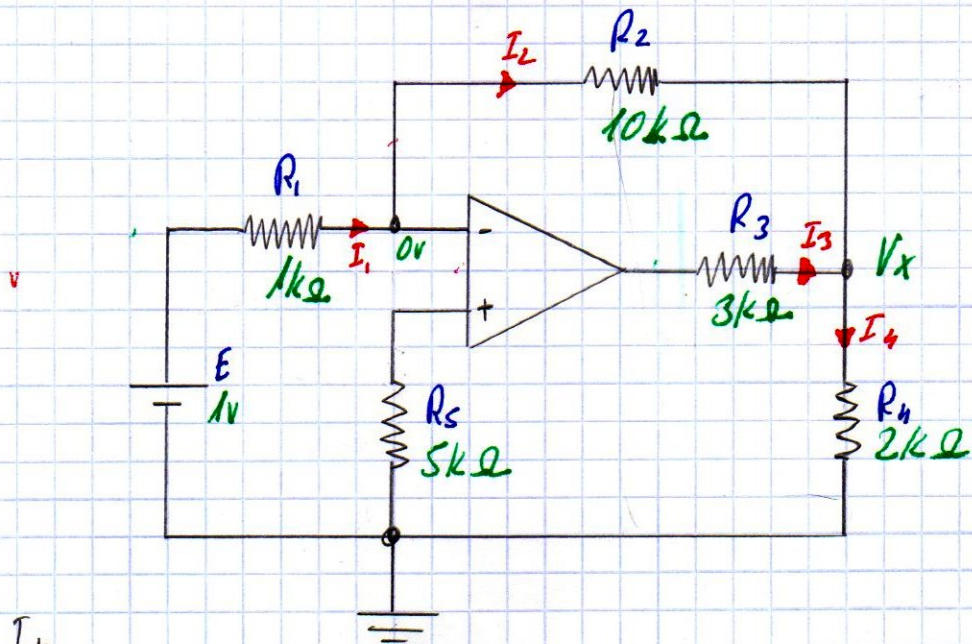
$$I_2 = I_5 - I_1 = 0.2 - 0.2 = 0 \Rightarrow V_x = E_1$$

$$I_4 = \frac{E_2 - V_x}{R_4} = \frac{4 - 2}{5} = 0.4 \text{ mA}$$

$$I_3 = I_1 + I_4 = 0.2 + 0.4 = 0.6 \text{ mA}$$

$$V_o = U_{R_3} + E_2 = I_3 R_3 + E_2 = 0.6 \cdot 10 + 4 \Rightarrow \boxed{V_o = 10 \text{ V}}$$

ky on sheet



$$I_2 + I_3 = I_h$$

$$I_1 = I_2$$

$$\frac{E - 0}{R_1} = \frac{0 - V_x}{R_2}$$

$$\frac{1}{1} = \frac{-V_x}{10} \Rightarrow \underline{V_x = -10V}$$

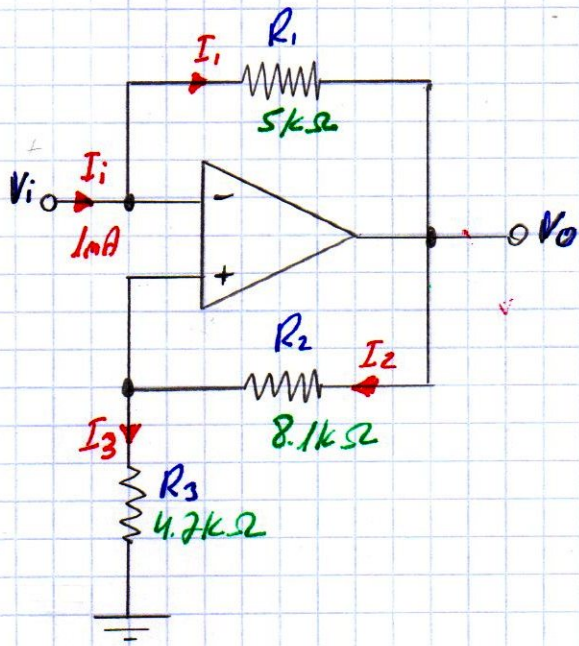
$$I_2 = \frac{0 - V_x}{R_2} = \frac{10}{10} = 1mA$$

$$I_4 = \frac{V_x - 0}{R_h} = \frac{-10}{2} = -5mA$$

$$I_3 = I_4 - I_2 = -5 - 1 \Rightarrow \boxed{I_3 = -6mA}$$



24 on 2ke



$$I_1 = I_i$$

$$I_2 = I_3$$

$$I_i = \frac{V_i - V_o}{5} \Rightarrow V_i - 5 = V_o$$

$$\frac{V_o - V_{in}}{R_2} = \frac{V_{in} - 0}{R_3}$$

$$\frac{V_o - V_{in}}{8.1} = \frac{V_{in}}{4.7}$$

$$\frac{V_{in} - 5 - V_{in}}{8.1} = \frac{V_{in}}{4.7}$$

$$\frac{-5 \cdot 4.7}{8.1} = V_{in}$$

$$\boxed{V_{in} = -2.9V}$$

$$V_o = V_{in} - 5$$

$$\boxed{V_o = -7.9V}$$

