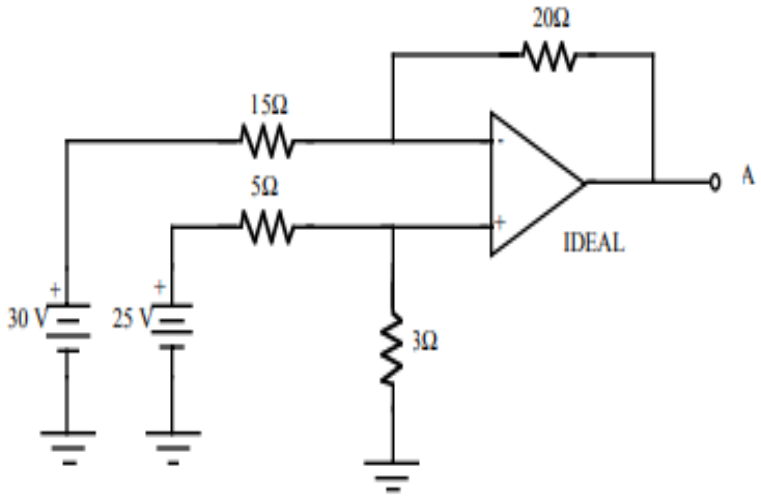
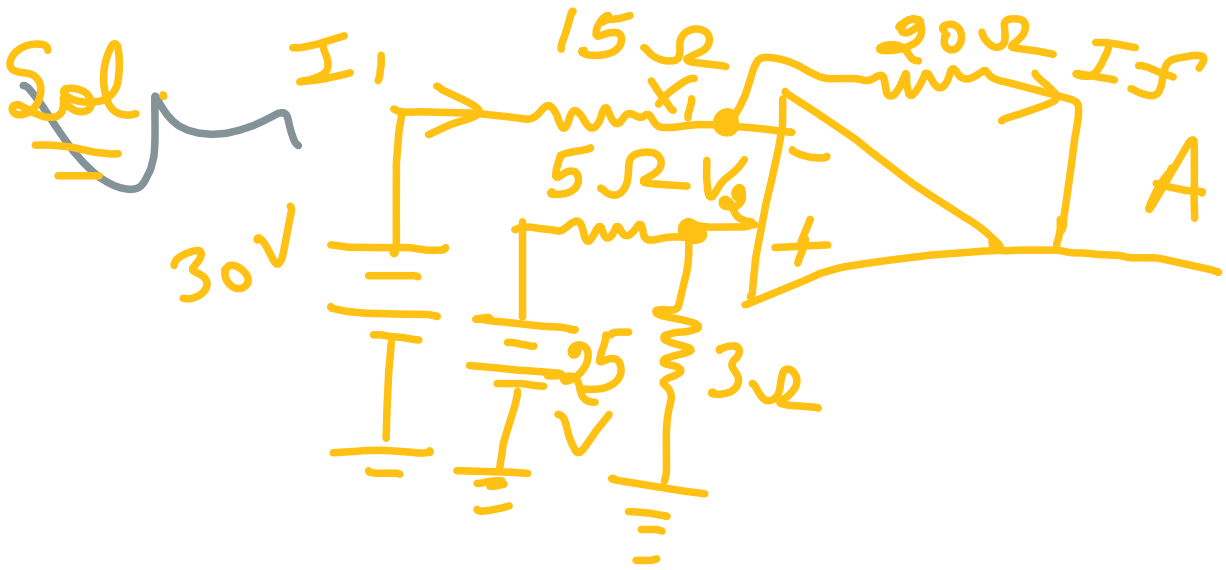
Q1. Find the voltage at terminal A in given figure:



Answer : -18.13V



$$V_2 = \frac{25 \times 3}{3+5} = \frac{75}{8}$$

$$= 9.375\,V$$

Due to Concept of Virtual ground

$$V_1 = V_2 = 9.375\,V$$

Now

$I_1 = I_f \rightarrow$ feedback Current

$$\therefore \quad \frac{30 - V_1}{3.1\text{K}} = \frac{V_1 - V_A}{20\text{K}}$$

$$120 - 4V_1 = 3V_1 - 3V_A$$

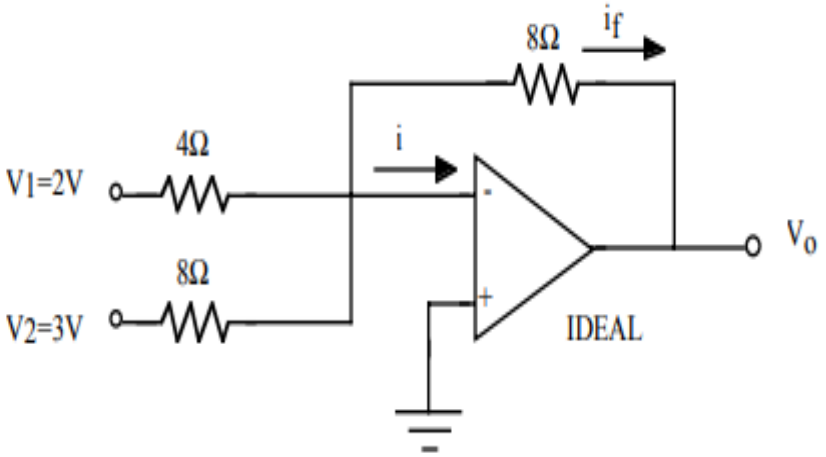
$$3V_A = 3V_1 + 4V_1 - 120$$

$$V_A = \frac{7V_1 - 120}{3}$$

$$\therefore V_A = \frac{7 \times 9.375 - 120}{3}$$

$$= -18.125 \text{ Volts}$$

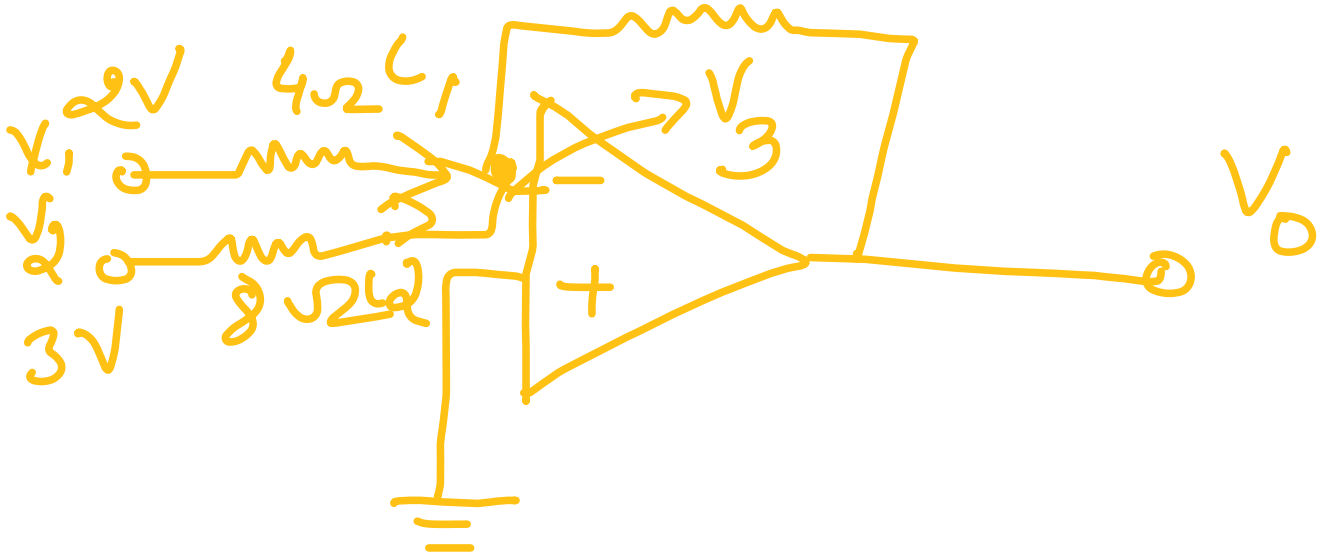
Q2. Find the current i and output voltage in given figure.



Answer : i = 0A, V_o = -7V

Sol

i_f 8Ω



input current is very small $i \approx 0A$

$V_3 = 0$ due to virtual ground

$$i_1 + i_2 = i_f$$

$$\frac{V_1 - V_3}{4} + \frac{V_2 - V_3}{8} = \frac{V_3 - V_0}{8}$$

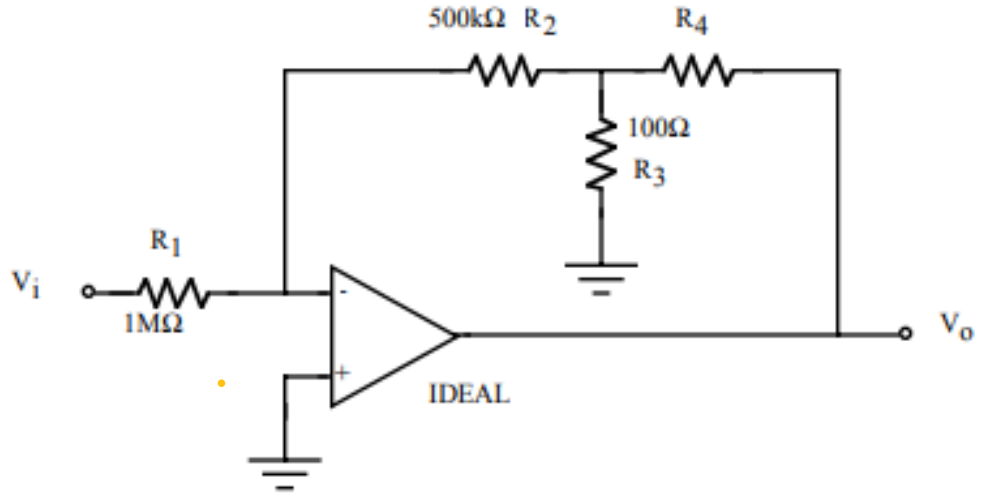
$$2 - 0 + 3$$

$$\frac{-0}{4} = \frac{0-V_o}{8}$$

Solving the above equation

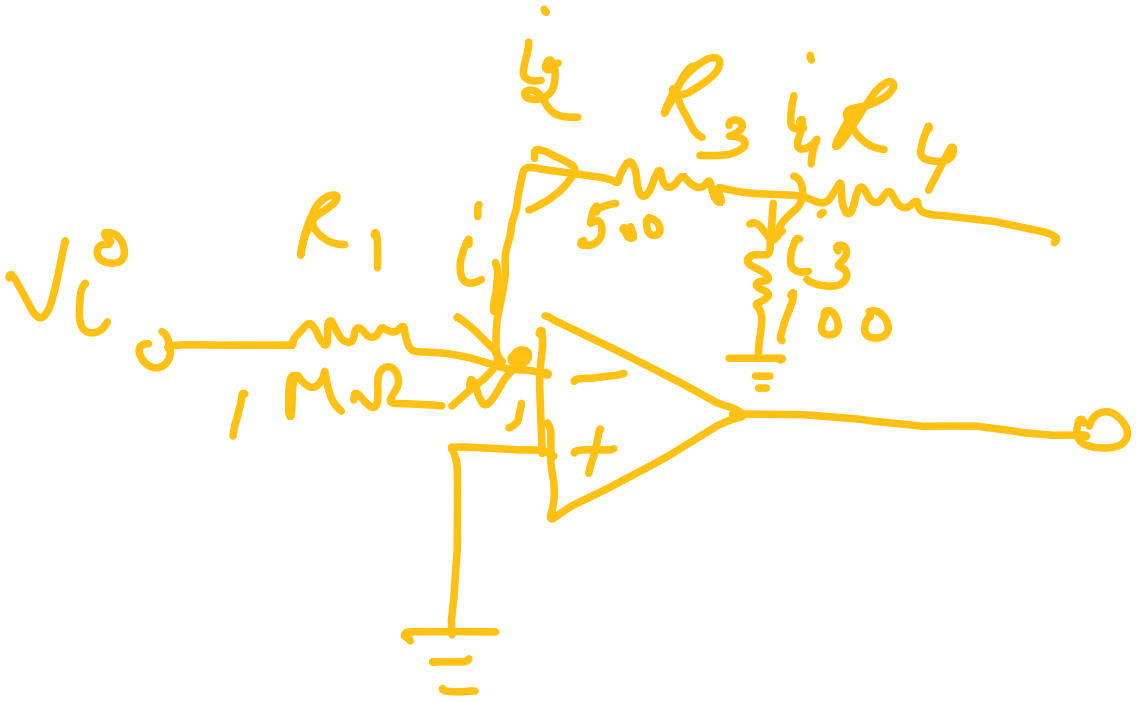
$$V_o = -7V$$

Q3. Evaluate the following amplifier circuit to determine the value of resistor R_4 in order to obtain a voltage gain (v_o/v_i) of -120.



Answer : R_4 = 24 kohm

Sol.



$$i_2 = i_3 + i_4$$

$$i_1 = i_2$$

and $V_1 = 0$ due to virtual gnd.

$$\frac{V_i - V_1}{1 \times 10^6} = \frac{V_1 - V_x}{500 \times 10^3} \quad -(1)$$

$$i_2 = i_3 + i_4$$

using

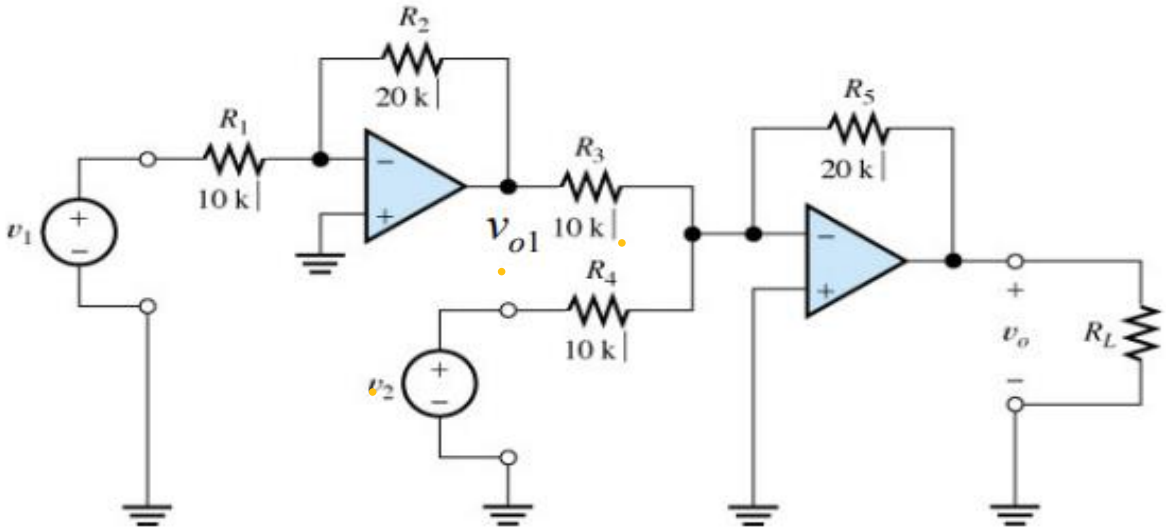
$$\frac{V_1 - V_x}{500 \times 10^3} = \frac{V_x - 0}{100} + \frac{V_x - V_0}{R_4} \quad -(2)$$

$$\frac{V_0}{V_i} = -120$$

Solve eq (1) & (2)

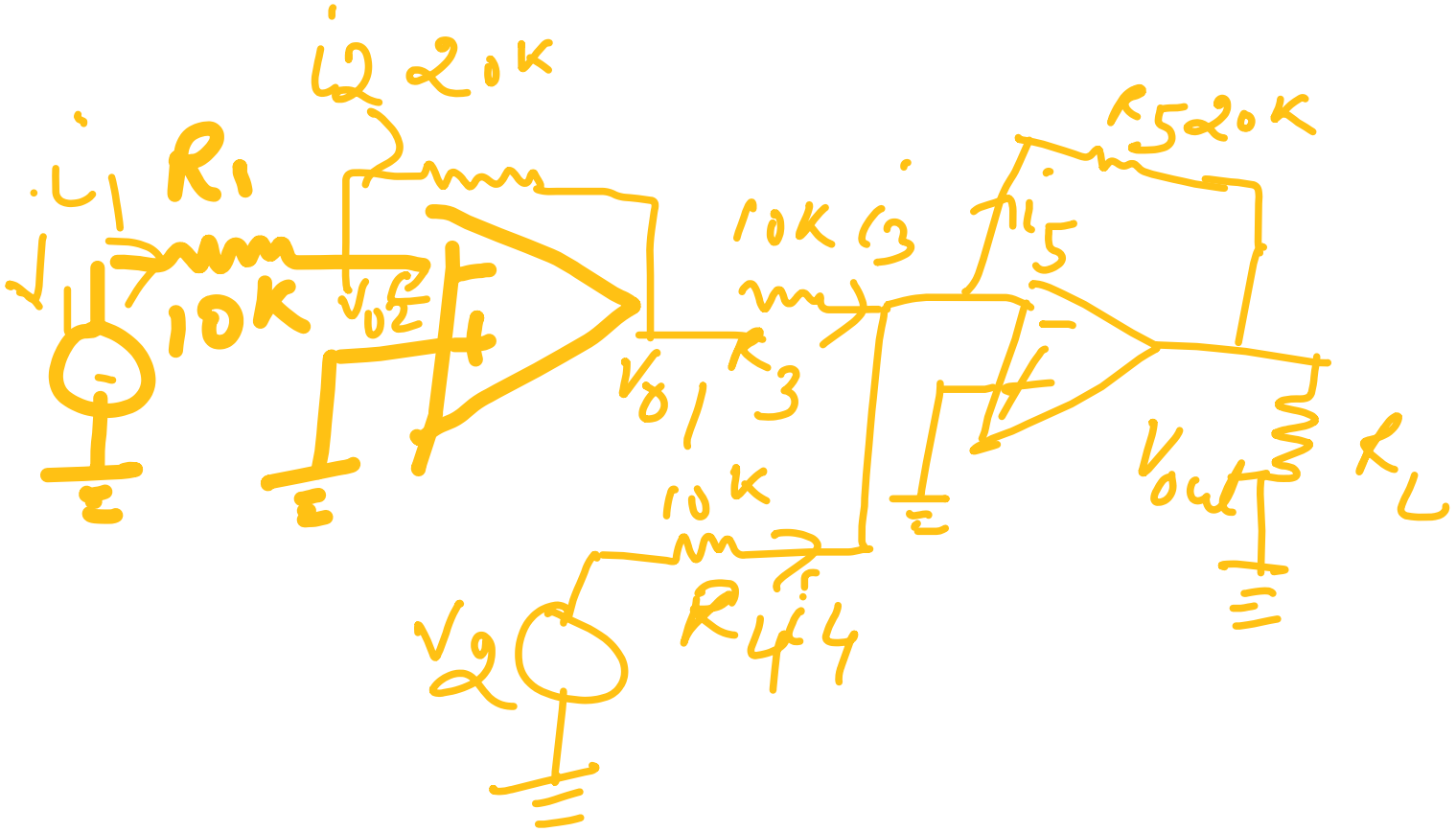
$$R_4 = 23.9\ k\Omega$$

Q4. Find an expression for the output voltage of given circuit.



Answer : $V_o = 4v_1 - 2v_2$

Slution



$$i_1 = i_2$$

$$\frac{V_1 - V_{o2}}{10} = \frac{V_{o2} - V_{o1}}{20}$$

$V_{o2} = 0$ due to virtual gnd

$$\frac{V_1}{10} = \frac{-V_{o1}}{20}$$ Also $i_3 + i_4 = 5$

$V_o = 4V_1 - 2V_2$