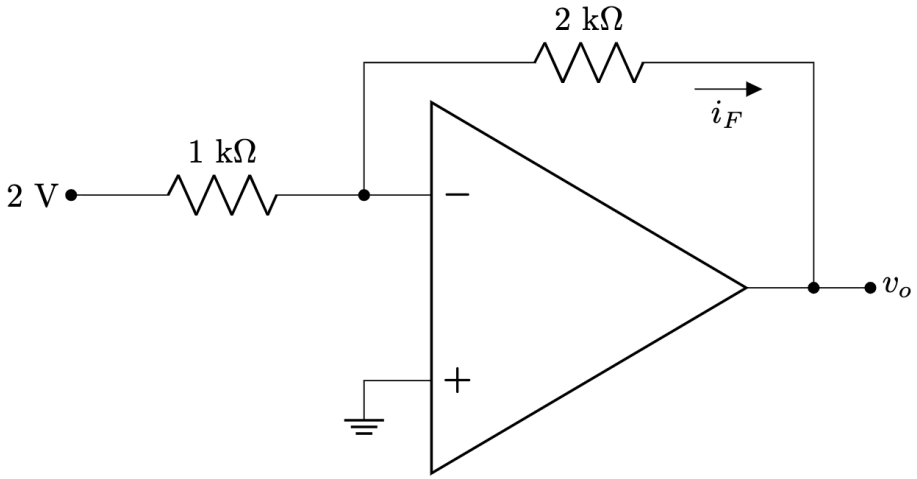
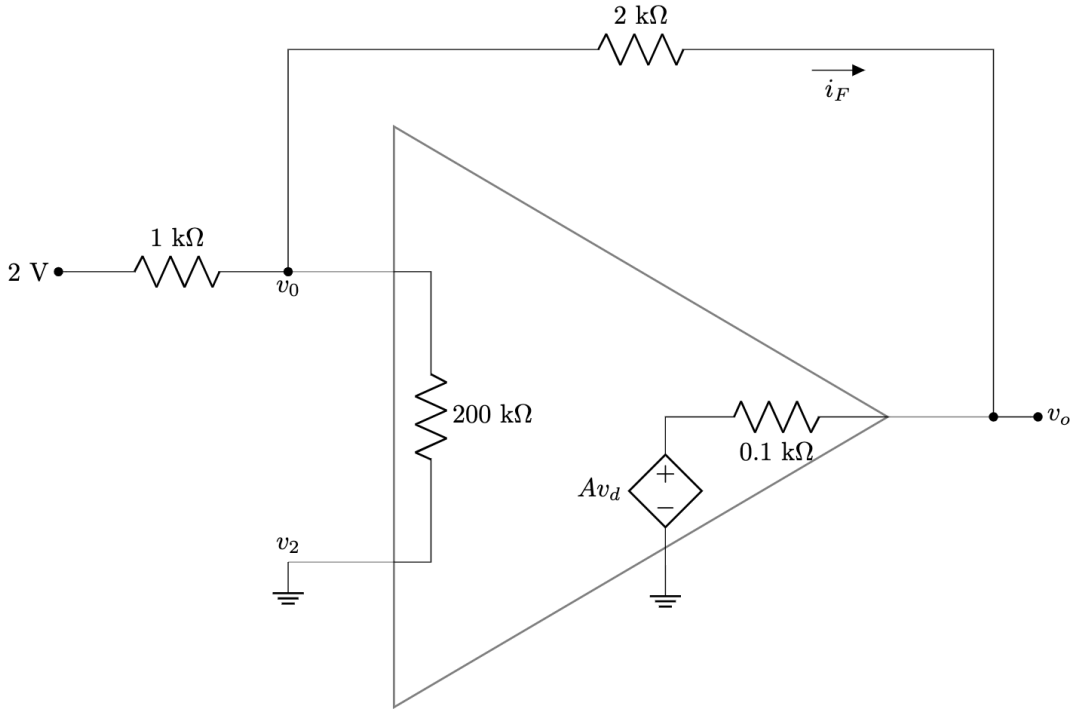
Example 5

Find i_F and v_o. Here, $R_i = 200\ k\Omega$, $R_o = 0.1\ k\Omega$, $A = 2\times10^5$



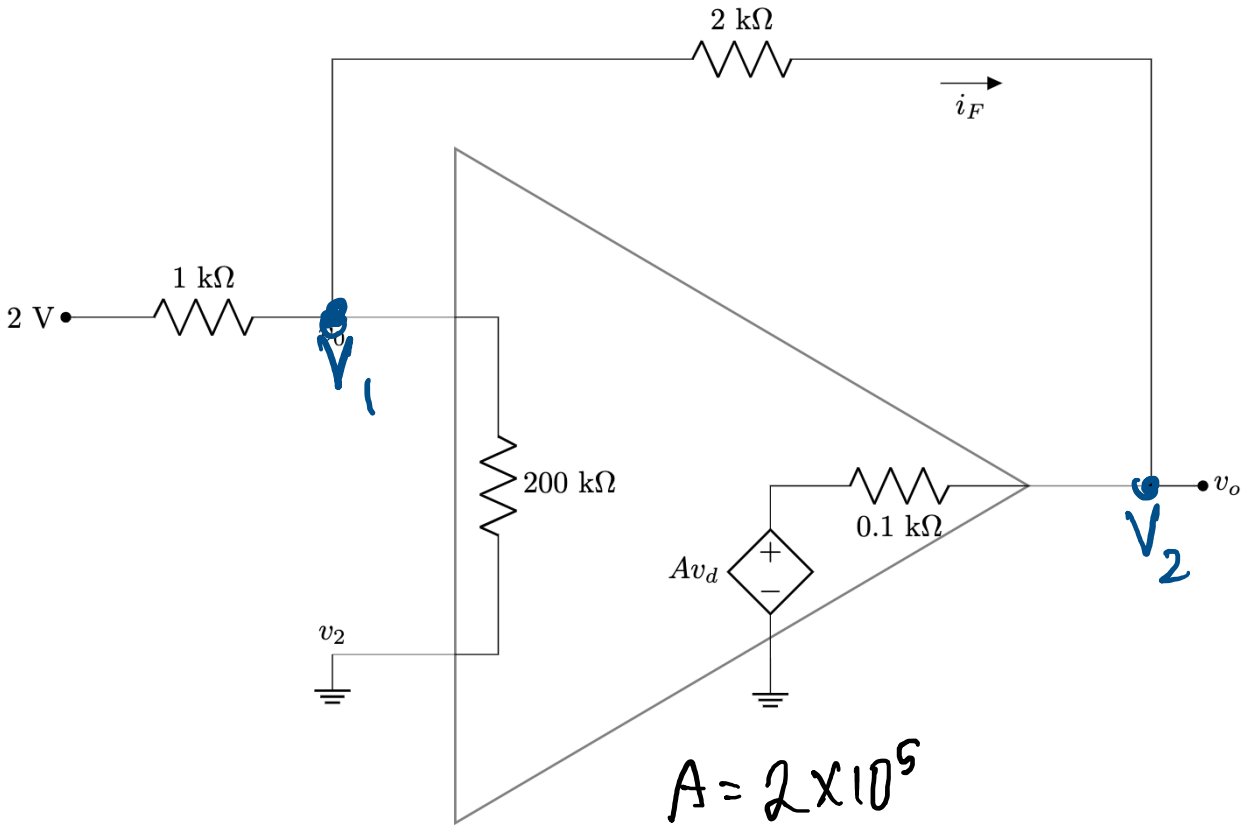
Solution:

Step 1: replace using equivalent circuit



Example 5

Step 2: Solve using KCL & KVL or nodal



$A = 2 \times 10^5$

$V_2 = 0\ V\ (GND)$

$A v_d = A(V_1 - V_2)$

$= A(V_1 - 0) = AV_1$

Nodal

$$V_1\left(\frac{1}{1} + \frac{1}{2} + \frac{1}{200}\right) - \frac{V_2}{200} - \frac{2}{1} = 0 \quad \text{— (I)}$$

$$V_2\left(\frac{1}{0.1} + \frac{1}{2}\right) - \frac{V_1}{2} - \frac{AV_1}{0.1} = 0 \quad \text{— (II)}$$

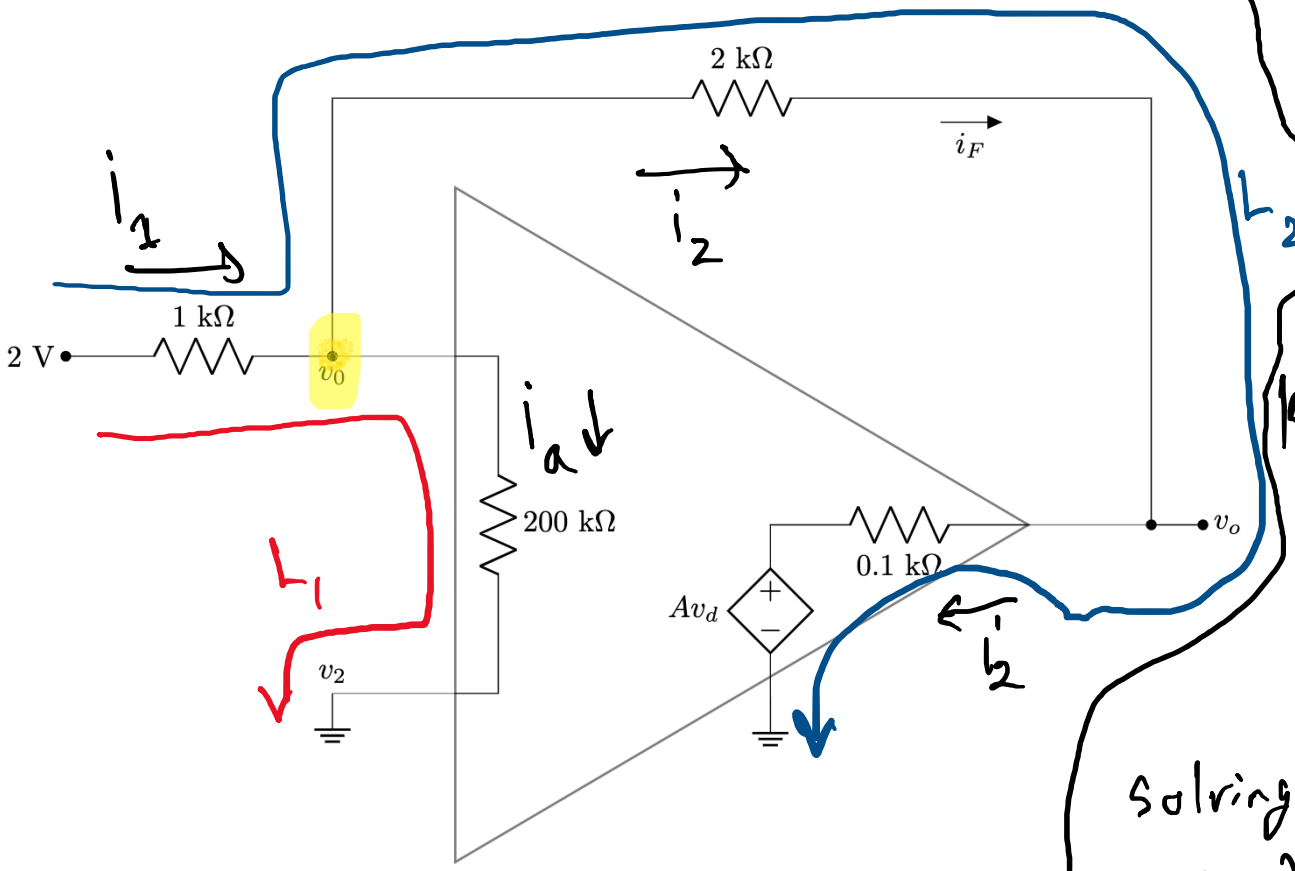
Solving (I) and (II) $\Rightarrow V_1 = \ldots$

$V_2 = \ldots$

$\therefore i_F = \frac{V_1 - V_2}{2} =$

Example 5

Step 2: Solve using KCL & KVL or nodal



KVL along L_1 ⇒

$i_1 \times 1 + i_a \times 200 = 2 - 0$ — (i)

KVL along L_2 ⇒

$i_1 \times 1 + 2 \times i_2 + 0.1 \times i_2 = 2 - AV_d$ — (ii)

KCL at ⇒ $i_1 = i_a + i_2$ — (iii)

$AV_d = A(V_1 - 0) = AV_1 = A(2 - i_1 \times 1)$ — (iv)

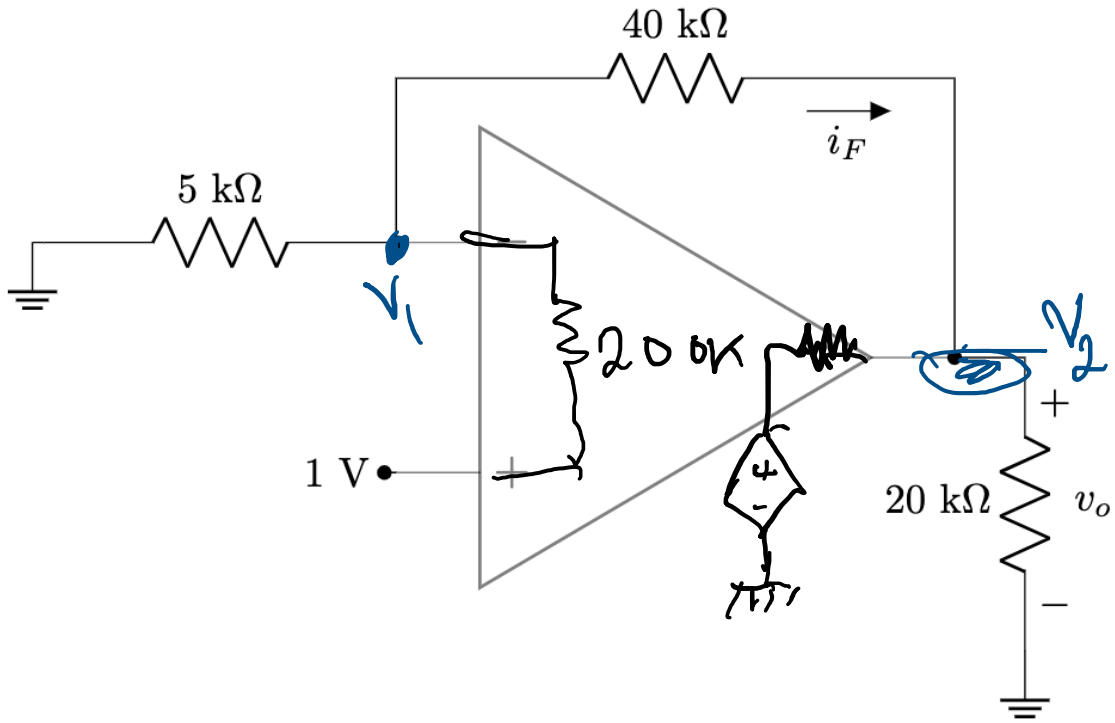
[Ohm's law]

Solving (i) - (iv) ⇒ $i_1 = \ldots$, $i_2 = \ldots$, $i_a = \ldots$

$\therefore V_0 = 2 - 1 \times i_1 - 2 \times i_2$

Example 6

Find i_F and v_o. Here, $R_i = 200\ k\Omega$, $R_o = 0.1\ k\Omega$, $A = 2\times10^5$



$$V_1\left(\frac{1}{5}+\frac{1}{200}+\frac{1}{40}\right)-\frac{V_2}{40}-\frac{1}{200}=0$$

$$V_2\left(\frac{1}{40}+\frac{1}{20}+\frac{1}{0.1}\right)-\frac{V_1}{40}-\frac{Av_d}{0.1}=0$$

$$\Rightarrow V_1 = \cdots,\ V_2 = \cdots$$

$$\therefore I_F = \frac{V_1 - V_2}{40}$$