Problem 1

Find the Thevenin equivalent of the circuit shown below with respect to the terminals $a$ and $b$.

\[ V_{TH} = \quad \quad \quad \quad \quad \quad \quad R_{TH} = \quad \quad \quad \quad \quad \quad \quad \]

\[ \beta = 4 \]
Problem 2

For the op-amp circuit below, find $v_o$ in term of $v_a$, $v_b$, and $v_c$. Assume that the op amps are ideal.

\[ v_o = \text{expression} \]
Problem 3

In the circuit at right, the switch has been closed for a long time and then opens at \( t = 0 \).

The capacitor voltage equation for \( t > 0 \) is

\[
v_c(t) = V_f - (V_f - V_i) \exp \left( -\frac{t}{RC} \right)
\]

Determine the quantities for the transient equation:

\[
V_f = ___________________________
\]

\[
V_i = ___________________________
\]

\[
\tau = RC = ___________________________
\]

Find the time \( t_1 \) at which capacitor voltage is halfway between \( V_i \) and \( V_f \):

\[
t_1 = _______________
\]
Problem 4

In the circuit at right, the switch has been open for a long time and then closes at $t = 0$.

The inductor current equation for $t > 0$ is

$$i_L(t) = I_f - (I_f - I_i) \exp \left( -\frac{t}{\tau} \right)$$

Determine the quantities for the transient equation:

$I_f =$ ___________________________ 

$I_i =$ ___________________________

$\tau = \frac{L}{R}$ = ___________________________

Find the time $t_1$ at which inductor current is halfway between $I_i$ and $I_f$: $t_1 =$ _______________________