ECE241
Quiz #5

The switch in the circuit shown below has been closed for a long time before it opens at time \( t = 0 \). Find:

1) The value of \( i_C(0^-) \), the current in the capacitor immediately before the switch opens,
2) The value of \( i_C(0^+) \), the current in the capacitor immediately after the switch opens,
3) The expression for \( i_C(t) \), \( t > 0 \).

\[ \begin{align*}
20 \text{ V} & \quad i_C(t) \quad 2.2 \, \mu\text{F} \quad 20 \, \Omega \\
\end{align*} \]

\[ i_C(0^-) = 0 \]

\[ i_C(0^+) = -\frac{v_C(0^-)}{R} = -\frac{-20}{20} = -1 \text{ A} \]

\[ x(t) = x_0 e^{-\frac{t}{\tau}} \quad \tau = RC \]

\[ v_C = v_C(0^+) e^{-\frac{t}{\tau}} \]

\[ v_C(t) = 20 e^{-\frac{t}{4.4 \times 10^{-5}}} \]

\[ i_C(t) = -\frac{20}{20} e^{-\frac{t}{4.4 \times 10^{-5}}} = -e^{-\frac{t}{4.4 \times 10^{-5}}} \]

\[ i_C(t) = -e^{-2.2727t} \quad t > 0 \]