SHOW ALL WORK!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

For the circuit shown the switch is open for a long time, and closed at $t = 0$.

(a) Calculate the current in $R_1$ at $t = 0$.
(b) Calculate the current in $R_1$ at $t = \infty$.
(c) Calculate the current in $R_2$ at $t = 2\tau$ (two time constants).
(d) If the switch is closed for a long time and then opened at $t = 0$ (a new $t = 0$), find a complete expression with all constants evaluated for the current in $R_2$.

$R_1 = 250 \, \Omega$, $R_2 = 550 \, \Omega$, $R_3 = 450 \, \Omega$; $e = 135 \, V$, $L = 4.20 \, mH$

\[ I_2 = \frac{e}{R_2 + \frac{R_2 R_3}{R_3 + R_1}} = \frac{135}{250 + 450} = 0.193 \, A \]

\[ I_{tot} = \frac{e}{R_1 + \frac{R_2 R_3}{R_3 + R_1}} \]

\[ V_2 = I_{tot} \left( \frac{R_2 R_3}{R_3 + R_1} \right) \]

\[ I_2 = \frac{V_2}{R_2} = \frac{1}{R_2} \left( \frac{e}{R_1 + \frac{R_2 R_3}{R_3 + R_1}} \right) = 0.122 \, A \]

\[ I_2(t) = I_\infty (1 - e^{t/\tau}) \]

With $I_\infty = 0.122 \, A$, at $t = 2 \tau$ we have: $I_2(2\tau) = 0.122 (1 - e^{-2}) = 0.106 \, A$

\[ I_2(t) = I_\infty \frac{e^{-t/\tau}}{1 + \frac{R_2}{R_1}} \]

$\tau = \frac{L}{R_1 + R_3} = \frac{4.20 \, \mu H}{250 \, \Omega + 450 \, \Omega} = 4.2 \times 10^{-6} \, s$

\[ \therefore I_2(t) = 0.122 \left( e^{-\frac{t}{4.2 \, \mu s}} \right) \, A \]