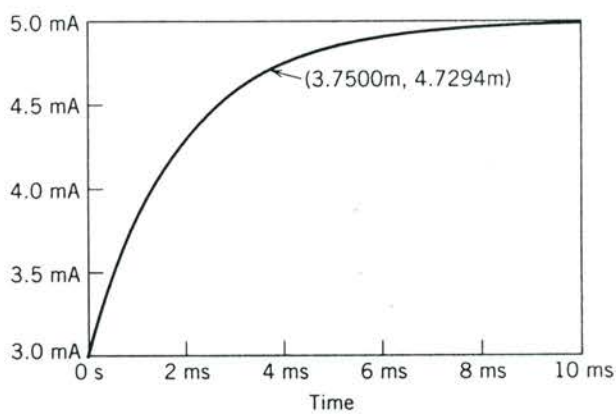
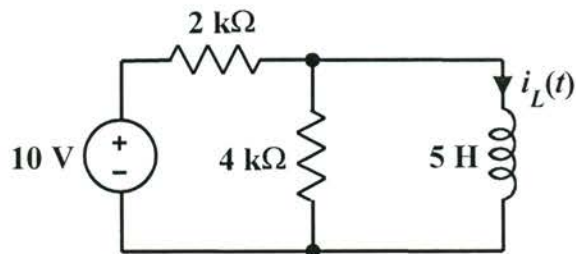
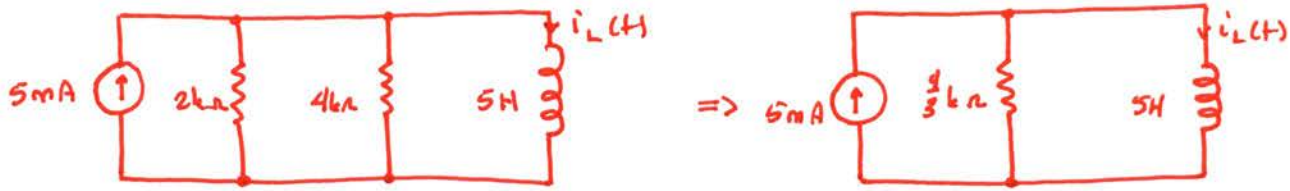


EE 2240
Problem #01

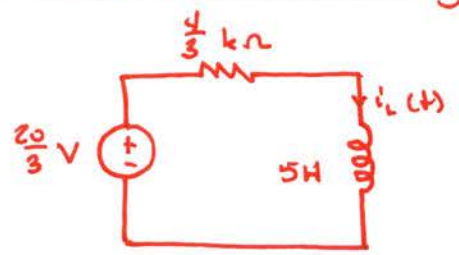
Consider the RL circuit shown below, where $i_L(0) = 3 \text{ mA}$. The accompanying plot is alleged to show the transient response of the circuit. A point on the curve has been labeled, indicating a time and the corresponding inductor current. Determine whether or not the plot is a true representation of the inductor current in this circuit.



A source transformation yields the following:



Another source transformation yields:



From KVL

$$(5H) \frac{di_L}{dt} + \left(\frac{4}{3} \times 10^3 \Omega\right) i_L = \frac{20}{3} V$$

$$\text{or} \quad \frac{di_L}{dt} + \frac{800}{3} i_L = \frac{4}{3}$$

Therefore,

$$i_L(t) = K_1 e^{-\frac{800}{3}t} + K_2$$

Solving for K_1 and K_2 yields

$$i_L(t) = -2e^{-\frac{800}{3}t} + 5 \text{ mA}, \quad t \geq 0$$

The initial and final values of this expression correspond to those shown on the plot.

Checking the value at $t = 3.75 \text{ ms}$, we have

$$i_L(3.75 \text{ ms}) = -2e^{-1} + 5 = 4.26 \text{ mA}.$$

The plot does not appear to be an accurate representation of $i_L(t)$.