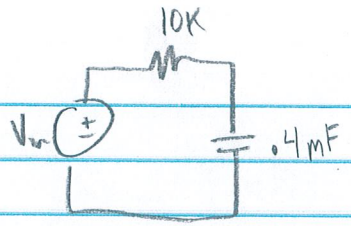
8.18

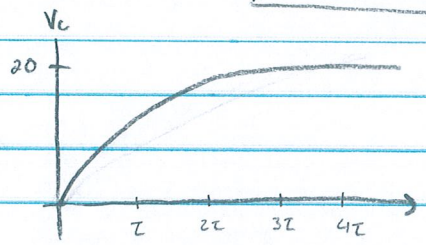



General Solution: $V_c(t) = V_{in} + (V(0) - V_{in})e^{-t/\tau}$ $\tau = RC = 4$

final $V_f = V_{in}$

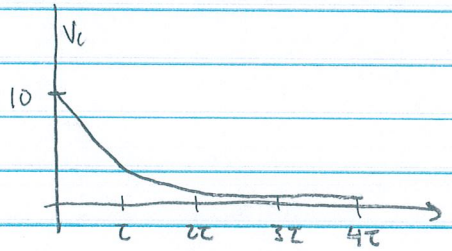
a) $V_c(0) = 0$

$V_{in} = 20\,u(t)$ → $\boxed{V_c(t) = 20 - 20e^{-t/4} \text{ volts.}}$




b) $V_c(0) = 10$

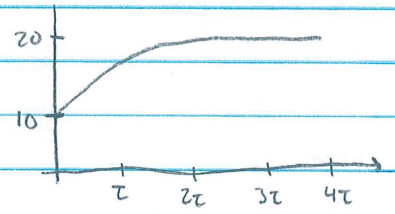
$V_{in}(t) = 0$ → $\boxed{V_c(t) = 10e^{-t/4} \text{ volts}}$




c) $V_c(0) = 10$

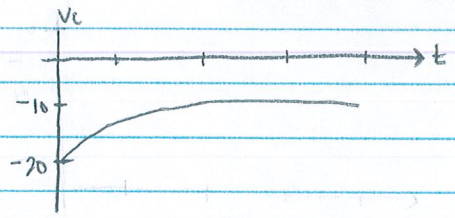
$V_{in}(t) = 20$ → By linearity, add the two above responses:

$\boxed{V_c(t) = 20 - 10e^{-t/4} \text{ volts}}$



d) $V_c(0) = -20$

$V_{in} = -10\,u(t)$ → $\boxed{V_c(t) = -10 - 10e^{-t/4}}$




e) $V_c(0) = 10$

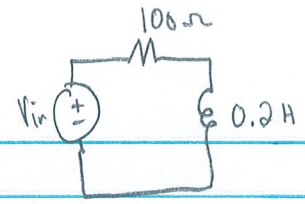
$V_{in} = 20\,u(t)$, find $i_c(t)$.

from part c.

$i_c = V_R/R$. $V_R = V_{in} - V_c = 20 - (20 - 10e^{-t/4})$

$\boxed{i_c = e^{-t/4}\ mA}$

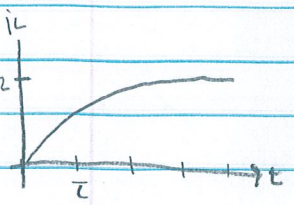
8.19



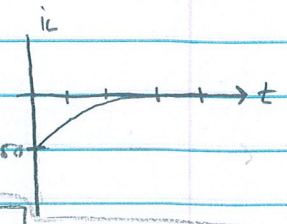

General solution: $i_L(t) = i_f + (i_L(0) - i_f)\, e^{-t/\tau}$ $\tau = L/R = .002$

$i_f = V_{in}/100\,\Omega$

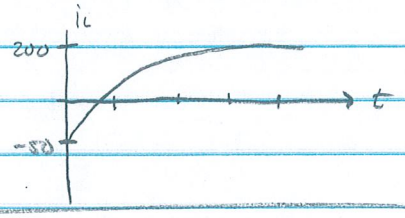
a) $i_L(0) = 0$
$V_{in}(t) = 20\,u(t)$ → $i_L(t) =$ $\boxed{0.2 - 0.2\, e^{-500t} \text{ Amps}}$



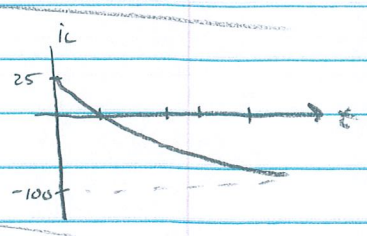

b) $i_L(0) = -50$ mA
$V_{in}(t) = 0$ → $i_L(t) =$ $\boxed{-0.05\, e^{-500t} \text{ Amps}}$




c) $i_L(0) = -50$ mA
$V_{in}(t) = 20\,u(t)$ → Add. $\boxed{i_L(t) = 0.2 - 0.25 e^{-500t} \text{ Amps}}$




d) $i_L(0) = 25$ mA
$V_{in} = -10\,u(t)$ → $\boxed{-0.1 + 0.125\, e^{-500t} \text{ Amps}}$




e) $i_L(0) = -50$ mA
$V_{in} = 20\,u(t)$ find $V_L(t)$. $V_L = V_{in} - V_R = V_{in} - i_L R$ (from Part c)

$= 20 - 100(0.2 - 0.25 e^{-500t})$

$= 20 - 20 + 25 e^{-500t}$

$\boxed{= 25\, e^{-500t} \text{ Volts}}$