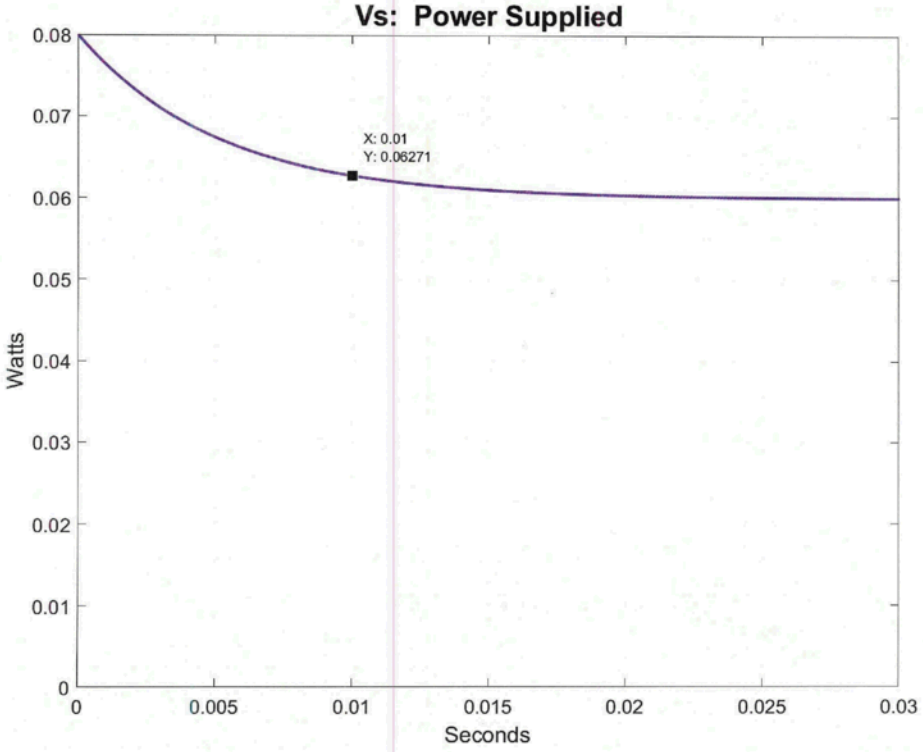
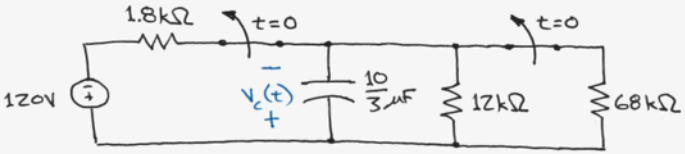

Vs: Power Supplied
X: 0.01
Y: 0.06271
Watts
Seconds
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.005
0.01
0.015
0.02
0.025
0.03

Problem 7.26



First find $v_c(t)$

$$v_c(0) = \frac{10.2}{1.8+10.2}(120) = 102\ V$$

$$V_{oc} = 0$$

$$\tau = RC = (12k\Omega)\left(\frac{10}{3}\mu F\right) = 40ms$$

So, $\underline{\underline{v_c(t) = 102e^{-25t}\ V}}$

a) $$p_{12k}(t) = \frac{v_c^2(t)}{12k\Omega} = 0.867e^{-50t}\ W$$

$$w_{12k}(t) = \int_0^t p_{12k}(\tau)\,d\tau$$

$$= \frac{0.867}{-50}e^{-50\tau}\Big|_0^t$$

$$= 17.34\left(1-e^{-50t}\right)\ mJ$$

$$\underline{\underline{w_{12k}(12ms) = 7.824\ mJ}}$$

b) $w_c(t) = \frac{1}{2} C v_c^2(t)$

$= \frac{1}{2}\left(\frac{10}{3} \times 10^{-6}\right)(102)^2 e^{-50t}$

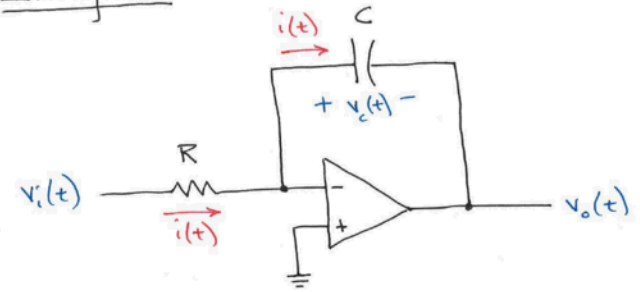
$= 17.34 e^{-50t}$ mJ

$w_c(t_x) = (.25)(17.34) = 17.34 e^{-50t_x}$

So, $-50t_x = \ln 0.25$

$t_x = \frac{\ln 0.25}{-50} = \underline{\underline{27.73 \text{ ms}}}$

Integrator



$$i(t) = \frac{v_i(t)}{R}$$

$$v_o(t) = -v_c(t) = -\left\{ v_c(0) + \frac{1}{C}\int_0^t i(\tau)\,d\tau \right\}$$

$$= -v_c(0) - \frac{1}{C}\int_0^t \frac{v_i(\tau)}{R}\,d\tau$$

$$= -v_c(0) - \frac{1}{RC}\int_0^t v_i(\tau)\,d\tau$$