HW #9-1

1) $v(t) = 40e^{-1000t} - 90e^{-4000t}$, $t \geq 0$

$L = 10\,mH$

$w = ?$

$\alpha = ?$

$C = ?$

$R = ?$

$s_1 = -1000 \quad s_2 = -4000$

$s_1 = -\alpha \pm \sqrt{\alpha^2 - w_0^2} = 1000$; $s_2 = -\alpha - \sqrt{\alpha^2 - w_0^2} = -4000$

a) $s_1 + s_2 = \frac{-2\alpha}{-2} = \frac{-5000}{-2} \Rightarrow \alpha = 2500$

$s_2 - 1000 = -2500 + \sqrt{2500^2 - w_0^2} \Rightarrow \alpha = \frac{R}{2C} = 2500$

$1500 = \sqrt{2500^2 - w_0^2}$

$w_0 = 2000$

$R = 2500 \cdot 2 \cdot 10m$

$R = 50\Omega$

$w_0 = \frac{1}{\sqrt{LC}} \Rightarrow C = \frac{1}{2000^2 \cdot 10m} =$ **25dF**

b) $= \frac{40e^{-1000t} - 90e^{-4000t}}{50} \Rightarrow i_R(t) = 0.8e^{-1000t} - 1.8e^{-4000t}$ A $t \geq 0$

$i_c(t) = \frac{C dV_c(t)}{dt} = 25u \cdot \frac{d}{dt}(40 \cdot e^{-1000t} - 90e^{-4000t})$

$= 25\mu(40e^{-1000t} \cdot -1000 - 90e^{-4000t} \cdot -4000)$

$i_c(t) = (-e^{-1000t} + 9e^{-4000}\,4A)$ $t \geq 0$