Solution to hw 5

1. a) $V_R = Ri = RI_0 e^{-at}\cos\omega t$

$$V_L = L\frac{di}{dt} = -LI_0 e^{-at}(a\cos\omega t + \omega\sin\omega t)$$

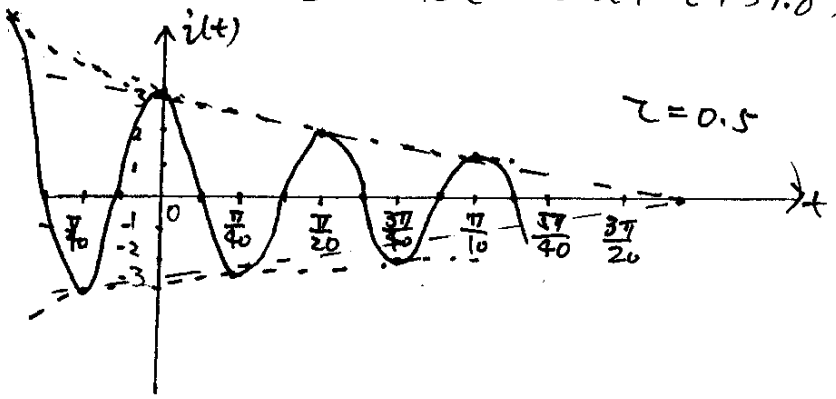
$$V_{RL} = V_R + V_L = I_0 e^{-at}[(R-La)\cos\omega t - L\omega\sin\omega t]$$

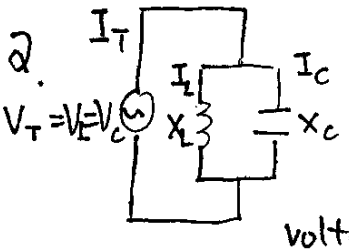
$$= V_0 e^{-at}\cos(\omega t + \theta)$$

where $V_0 = I_0\sqrt{(R-La)^2 + L^2\omega^2}$ and $\theta = \tan^{-1}[L\omega/(R-La)]$

b) Plug in the data, $V_0 = 18.75\,V$, $\theta = 39.8°$

$\therefore\ i = 3e^{-2t}\cos 40t \qquad V_{RL} = 18.75e^{-2t}\cos(40t + 39.8°)$



2. 

In the pure LC parallel-tuned circuit (that is, one in which there is no resistance), the coil and the capacitor are placed in parallel and the applied voltage V_T appears across these circuit components. In this parallel-tuned circuit, as in the series-tuned circuit, resonance occurs when the inductive reatance is equal to the capacitive reactance.

$$X_L = X_C$$