Homework 3:

Problem 1

a)

given: $P = \frac{R}{2L}, \quad \omega_o = \sqrt{\frac{1}{Lc}}, \quad LI'' + RI' + C^{-1}I = E'(t)$

Now we are going to take the value of $E(t)$ and find it's derivative

$$E(t) = E_o \sin(\omega t)$$
$$E'(t) = \omega E_o \cos(\omega t)$$

This gives us that our original equation is actually

$$LI'' + RI' + C^{-1}I = \omega E_o \cos(\omega t)$$

Now we can take the particular solution, X_p, from the book and plug our values in

$$X_p = [\frac{\omega E_o}{L\sqrt{(2\omega p)^2 + (\omega_o^2 - \omega^2)^2}}] \sin(\omega t - y)$$

b)

To find the amplitude, let's first consider the form $y = Asin(B(x + C)) + D$

Where A is the amplitude, we can see from our equation from a) that in our case,

$$A = \frac{\omega E_o}{L\sqrt{(2\omega p)^2 + (\omega_o^2 - \omega^2)^2}}$$

c)

An amplitude is maximized when it's derivative(slope) is 0, or when $A' = 0$

$$A' =$$