Hwmk 5

Math 528 Summer Session 1

Due 5/27 (Friday at 11:59 pm)

1 Short Circuit.... Work It

For a RLC Cicuit, we can model the current $I(t)$ via the differential equation:

$$LI'' + RI' + \frac{1}{C}I = E'(t)$$

where L is the inductance, R is the resistance, C is the capacitance, and E is the electromotive force. Suppose the resistance is 18 ohms, the inductance is 1 henry and the capacitance is $12.5 \cdot 10^{-3}$ farads. You have an alternating electromotive force $100\sin(10t)$ volts and our initial conditions are that $I(0) = 0$ and $Q(0) = 0$, where $Q(t) = \int I(t)dt$.

(a) [2 points] What is the initial condition in terms of $I'(t)$ (Check page 96 for help with this)?

(b) [2 points] What is the solution to the homogeneous problem?

(c) [3 points] What is the solution to the particular problem?

(d) [1 point] Find the steady state solution by taking the limits of the general solution as $t \to \infty$.

(e) [2 points] What other system does this ODE model? And what quantities would L, R, $1/C$, E and I represent in this other model?