

Math 222, Spring 2016.

Present your work in an organized fashion. Make sure that your work is algebraically correct and logically sound. Show all your work. Discussion (if necessary) with others is encouraged, while copying other's solution is a violation of NJIT student honor code.

**Homework Problems for Week 8. MATH 222, Spring 2016.
Sections 3.7-3.8**

- Problem 1. A force of 400 N stretches a spring 2 m. A mass of 50 kg is attached to the end of the spring and is initially released from the equilibrium position with an upward velocity of 10 m/s. Find the equation of motion.

- Problem 2. A force of 2 pounds stretches a spring 1 foot. A mass weighting 3.2 pounds is attached to the spring, and the system is then immersed in a medium that offers a damping force numerically equal to 0.4 times the instantaneous velocity.
 - (a) Find the equation of motion if the mass is initially released from rest from a point 1 foot above the equilibrium position.
 - (b) Express the equation of motion in the form $x(t) = Re^{-\kappa t} \sin(\omega t + \delta)$.
 - (c) Sketch the result.

- Problem 3. Consider the model of the LRC series circuit,

$$L \frac{d^2q}{dt^2} + R \frac{dq}{dt} + \frac{1}{C}q = E(t),$$

where L denotes the inductance, R the resistance, C the capacitance, and $q(t)$ the charge on the capacitor at time t .

- (a) Find the solution for the steady state charge when $L = 1\text{H}$, $R = 2\Omega$, $C = .25\text{f}$, and $E(t) = 50 \cos(t)\text{V}$.
- (b) As $i = \frac{dq}{dt}$, modify the differential equation above to find the steady state solution for the current $i(t)$.