

# Homework #1: Phys 3320: Prof. Olness Spring 2012

***DUE: Friday, 27 January 2012***

Consider the equation:

$$x'' + 2\gamma x' + \omega_0^2 x = Q_0 \cos(\omega_D t)$$

The term  $2\gamma x'$  is the friction (dissipative) term.

The term  $Q_0 \cos(\omega_D t)$  is the driving term.

- 1) Solve  $x'' + 0 + \omega_0^2 x = 0$ .
- 2) Solve  $x'' + 2\gamma x' + \omega_0^2 x = 0$
- 3) Solve  $x'' + 0 + \omega_0^2 x = Q_0 \cos(\omega_D t)$
- 4) Solve  $x'' + 2\gamma x' + \omega_0^2 x = Q_0 \cos(\omega_D t)$

Goals: We are trying to obtain the general solution for each case, and characterize the solution in terms of the physical expectations. Later we'll verify these numerically.

Note, you may find it convenient to define:  $\omega_1^2 = \omega_0^2 - \gamma^2$ .

**Your mission:** Solve each of the 4 above equations BY HAND. You can refer to your old texts and other reference material. The important point is that you UNDERSTAND the physical properties of the solutions.