PH1140 D09 **Homework 2 [190 points]** **Due Thursday March 26, 2009**

The numbers in brackets [ ] are the grade point values.

Oscillator Energy

1. [20] Y&F Exercise 13.25.
2. [20] For Y&F Exercise 13.56, let the oscillator be at maximum amplitude $A_0 = 1.44\ cm$ at time $t = 0$.

a) Find the energy $E(t)$ of the damped oscillator.

b) At what point in time does E fall to half its initial value?

Forced Oscillations

3. [20] Y&F Exercise 13.60.
4. [30] Y&F Exercise 13.61.

Other Oscillators

5. [30] Y&F Exercise 13.34.
6. [20] Y&F Exercise 13.36.

The LCR Circuit

7. [30] Y&F Exercise 30.38.
8. [20] Y&F Exercise 30.41.

Suggested ***examples***: Y&F 13.4, 13.5, 30.10, 30.11

Suggested exercises: Y&F 13.35, 13.37, and the following:

An LCR circuit obeys the equation of motion

$$\ddot{q} + \gamma\dot{q} + \omega_0^2 q = 0\,.$$

a) For $R = 33\ \Omega$, find the values of C and L to give $f_d = 1\ kHz$ and and $Q = 3$.

A forcing voltage $V(t)$ is applied, such that

$$\ddot{q} + \gamma\dot{q} + \omega_0^2 q = \frac{V(t)}{L}\,.$$

$$V(t) = V_{max}\ \cos(\omega t).$$

b) Given $V_{max} = 2.2\ V$, $\omega = 1610\ rad/s$, and using the values of L, C, R from part (a), find the steady state amplitude and phase.