

PHY 3221 : Intermediate Mechanics, Spring 2002

February 22<sup>nd</sup>, 2002

Assignment # 7

(due Friday March 1<sup>st</sup>, 2002, at the beginning of class)

1. Problem 3.22 of Marion and Thornton's book.
2. Problem 3.24 of Marion and Thornton's book.
3. A damped harmonic oscillator with  $m = 10$  Kg,  $k = 250$  N/m, and  $b = 60$  Kg/s is subject to a driving force given by  $F_0 \cos(\omega t)$ , where  $F_0 = 48$  N.
  - (a) What value of  $\omega$  results in steady-state oscillations with maximum amplitude? Under this condition:
  - (b) What is the maximum amplitude?
  - (c) What is the phase shift?
4. Consider the force  $F(t)$  with periodic triangular shape discussed in class:

$$F(t) = F_0 \begin{cases} -\frac{4}{\tau} \left( t - \frac{\tau}{4} \right) & 0 \leq t \leq \frac{\tau}{2} \\ \frac{4}{\tau} \left( t + \frac{\tau}{4} \right) & -\frac{\tau}{2} \leq t \leq 0 \end{cases}$$

Obtain its Fourier expansion. Plot the function and the sums of the first two, three, four and five terms. Discuss your results.

5. Problem 3.32 of Marion and Thornton's book.