

Math 207 Quiz #8
May 24, 2011

Name: _____

Show all work and answers on a separate sheet. Put a box around your final answer.

1. A 4-kg mass is attached to a spring hanging from the ceiling, thereby causing the spring to stretch 1.635 meters upon coming to rest at equilibrium. At time 0, an external force $F(t) = 6 \cos(2t)$ Newtons is applied to the system. The damping constant for the system is 3 N-sec/m.
 - (a) (1 pt.) Given that gravity is 9.81 m/sec^2 , find the spring constant.
 - (b) (4 pts.) Determine the steady-state solution for the system **and** give the maximum displacement of the steady-state solution. (Simplify your answer.)
 - (c) (2 pts.) Find the resonance frequency of the system.
 - (d) (3 pts.) If the system was at resonance (with all else being equal), what would the maximum displacement of the steady-state solution be? (Round your answer to two decimal places after the decimal.)

Useful formulas and equations from §4.10:

$$y_p = \frac{F_0}{\sqrt{(k-m\gamma^2)^2 + b^2\gamma^2}} \sin(\gamma t + \phi) \quad \text{where} \quad \tan \phi = \frac{k-m\gamma^2}{b\gamma} \quad \gamma_r = \sqrt{\frac{k}{m} - \frac{b^2}{2m^2}} \quad l = \frac{mg}{k}$$