

Math 207 Quiz #9
June 2, 2010

Name: _____

Show all work and answers on a separate sheet with a box around your final answer. You can use calculators, but aside from arithmetic, you must show your work.

1. A 4-kg mass is attached to a spring hanging from the ceiling, thereby causing the spring to stretch 1.635 m upon coming to rest at equilibrium. At time 0, an external force $F(t) = 6 \cos(2t)$ N is applied to the system. The damping constant for the system is 3 N-sec/m.

(a) (4 pts.) Determine the steady-state solution for the system. (Simplify your answer.)

(b) (2 pts.) Find the resonance frequency of the system.

2. (4 pts.) Find a general solution of the system $\begin{cases} x' = x - y \\ y' = y - 4x \end{cases}$ where differentiation is with respect to t .

Useful equations and formulas from §4.10:

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