

Millersville University
Department of Mathematics
MATH 365, *Ordinary Differential Equations*, Homework 6
March 19, 2004

Please answer the following questions. Answers without justifying work will receive no credit. Partial credit will be given as appropriate, do not leave any problem blank. Each problem is worth 10 points. Your completed assignment is due at class time on Wednesday, March 24, 2004.

1. A 3 pound weight stretches a spring 6 inches. When the weight is in its equilibrium position, it is given a downward velocity of 2 feet per second. Find the position of the weight as a function of time. What are the amplitude, period, and frequency of the oscillation? You may ignore friction.
2. A spring is stretched 10 cm by a force of 1250 dynes. A mass of 5 grams is suspended from the spring and, after it has come to equilibrium, is pulled down 20 cm and released. The damping force is proportional to the velocity of the mass with a proportionality constant of 30. Find the position of the mass as a function of time.
3. A spring is stretched 10 cm by a force of 500 dynes. A mass of 2 grams is suspended from the spring and allowed to come to equilibrium. A force equal to $200 \sin 5t$ dynes is applied externally to the system. The damping force is proportional to the velocity of the mass with a proportionality constant of 20. Find the general solution and the steady-state solution of the spring/mass system.
4. A spring is stretched 20 cm by a force of 8000 dynes. A mass of 4 grams is suspended from the spring and allowed to come to equilibrium. A force equal to $60 \cos \omega t$ dynes is applied to the system. Assuming there is no damping in the system find the position of the mass as a function of time for all positive values of ω . At which value of ω will resonance occur?