

## Math 225 – Quiz #9: Higher-Order Applications

Clearly and neatly show all work for each problem. Solutions with no work will receive no credit.

1. A 4-foot spring measures 8 feet long after an 8-pound weight is attached to it. The medium through which the weight moves offers resistance equal to  $\sqrt{2}$  times the instantaneous velocity. Set up and solve a differential equation to find the equation of motion if the weight is released from the equilibrium position with a downward velocity of 4 ft/s.
2. When a mass of 2 kilograms is attached to a spring whose constant is 32 N/m, it comes to rest in the equilibrium position. A force equal to  $f(t) = 68e^{-2t} \cos 4t$  is then applied to the system. Set up and solve a differential equation to find the equation of motion if there is no damping.
3. Given a beam of length  $L = 1$  and  $w_0 = 48 EI$ , set up and solve a differential equation to find the deflection of the beam  $y(x)$  when:
  - a) The beam is simply supported at both ends, with  $w(x) = w_0 x$ .
  - b) The beam is embedded at its left end and free at its right end, with  $w(x) = w_0 x$ .