Second Exam

Tuesday, October 22, 2012

This exam is closed book, but you may use calculators. Make sure your name is on all pages. Show all work, and show it in a logical and organized manner. You may keep this exam sheet.

1. Find the solution to the following initial value problems.

   (a) $y'' + 25y \quad = \quad 0, \qquad y(0) \; = \; 1, \; y'(0) \; = \; 0.$

   (b) $y'' + 25y \quad = \quad 0, \qquad y(0) \; = \; 0, \; y'(0) \; = \; 1.$

   (c) $y'' + 25y \quad = \quad \sin(t), \quad y(0) \; = \; 0, \; y'(0) \; = \; 0.$

   (d) $y'' + 25y \quad = \quad \sin(5t), \; y(0) \; = \; 0, \; y'(0) \; = \; 0.$

   (e) $y'' + 4y' + 4y \; = \; 0, \qquad y(0) \; = \; 1, \; y'(0) \; = \; 0.$

2. The charge Q at time t in a linear electrical circuit is modelled with the following initial value problem:

$$Q'' + 25Q = 0, \quad Q(0) = 1, \quad Q'(0) = 5. \tag{1}$$

   (a) Write the solution to (1) in the form $Q(t) = A\cos(\omega_0 t - \delta)$.

   (b) State the amplitude, angular velocity ("natural frequency"), phase shift, and period of Q.