Math 363   Homework Due Monday, October 30

Problems 3.6–16, 24. Use the parameter values mass $m = 1$, spring constant $k = 17$, and damping coefficient $b = 2$.

Proceed as follows:

a. Write the second-order differential equation for the displacement $y(t)$ and the corresponding first-order system.

b. Calculate the eigenvalues of the system matrix. (Don't bother calculating the eigenvectors.)

c. Give the general solution for the displacement $y(t)$.

d. Determine the solution $y(t)$ which satisfies the initial conditions $y(0) = 1$, $y'(0) = 4$.

e. Sketch the graph of the solution in part d.

f. Sketch the phase portrait of the system and highlight the solution in part d. Mark the location and indicate the nature of the equilibrium point.

g. Describe the motion of the mass for the initial conditions in part d. In particular, how often does the mass cross the rest position $y = 0$? How quickly (that is, at what functional rate) does the mass approach equilibrium? Be specific.