Final exam, Dec. 14, 2011 **Name:**
Math 527, University of New Hampshire **Section:**

INSTRUCTIONS: PLEASE READ CAREFULLY
Write your name and section number above. 5 pts will deducted if either is missing or illegible.
Write your final answers in the space provided. Show your work on attached sheets.

Problem 1: (15 points) Find the general solution of the differential equation.

$$y' - 6x(y-1)^{2/3} = 0$$

Problem 2: (15 points) Write down the general solution of each equation. For (b) and (c), assume $k > 0$. It is not necessary to show your work.

(**a**) $y' + ky = 0$

(**b**) $y'' + ky = 0$

(**c**) $y'' - ky = 0$

Problem 3: (20 points) Find the solution of the initial value problem.

$$y'' + 4y = \sin 3x, \quad y(0) = y'(0) = 0$$

Problem 4: (20 points) Find the solution of the initial value problem.

$$y'' + 2y' + 5y = \delta(t-3), \quad y(0) = 1,\ y'(0) = 0$$

Problem 5: (15 points) Find the general solution of the differential equation as a power series centered about $x = 0$. The first three terms of each linearly independent solution are enough.

$$y'' - (x+1)y' - y = 0$$

Problem 6: (15 points) Find the general solution of the differential equation. Express your answer in terms of real-valued functions.

$$\mathbf{x}' = \begin{pmatrix} 5 & 1 \\ -2 & 3 \end{pmatrix} \mathbf{x}$$