Homework #4 **Math 527, UNH spring 2013**
Due Friday Feb 22nd in lecture

Problems 1-7: Find the general solution of the ODE. If initial values are provided, plug them in to solve the initial-value problem as well. For problems 1 & 2, use the ansatz $y(x) = e^{\lambda x}$ rather than applying 1st order linear solution method. For problems with complex roots, express your answers in terms of trig functions rather than complex exponentials.

1. $y' - 3y = 0$

2. $y' + 3y = 0$

3. $y'' - 9y = 0$

4. $y'' + 9y = 0$

5. $y'' - 5y' + 6y = 0, \quad y(0) = 1,\ y'(0) = 1$

6. $y'' - 6y' + 9y = 0, \quad y(0) = 1,\ y'(0) = 1$

7. $y'' + 6y' + 13y = 0, \quad y(0) = 1,\ y'(0) = 2$

Problem 8: Plug $x = i\omega t$ (where $i = \sqrt{-1}$) into the Taylor series expansion of e^x to show that

$$e^{i\omega t} = \cos\omega t + i \sin\omega t$$

You can use the Taylor expansions of $\cos x$ and $\sin x$ without deriving them.

Problem 9: Use reduction of order and the solution $y_1(x) = x$ to find the general solution of

$$x^2 y'' + 2xy' - 2y = 0$$