Homework #3 **Math 527, UNH spring 2014**
Due Thursday, February 21th in recitation

Instructions, same as usual: Solve the problems, simplifying the solution as much as you can. AWE: Always Write Equations, and ADTSTTBSOTE: Always Do The Same Thing To Both Sides Of The Equation. Your work should be legible, organized, and written on loose-leaf paper. Staple the pages together in the upper left-hand corner. Write your name, "Math 527, section #" and "HW 3" in the upper-right corner.

Problems 1-6. Find the general solution. If initial conditions are given, also solve the initial value problem. The "prime" notation indicates differentiation: $y' = dy/dx$, etc.

1. $3y'' + 6y' + 2y = 0$

2. $y'' + 2y' + 3y = 0$

3. $y'' - 6y' + 9y = 0$

4. $4y'' - 4y' + y = 0; \quad y(0) = 0,\ y'(0) = 3$

5. $2y'' + y' - 10y = 0; \quad y(1) = 5,\ y'(1) = 2$

6. $y'' + 2y' + 5y = 0; \quad y(0) = 0,\ y'(0) = 2$

Problem 7. Show that $e^{i\omega t}$ and $e^{-i\omega t}$ and are linearly independent complex-valued solutions of the ODE $y'' + \omega^2 y = 0$. Using these complex solutions, derive two linearly independent real-valued solutions, and then use those to form the general real-valued solution of the ODE.

Problem 8. Use Euler's formula to show that $(\cos x + i \sin x)^n = \cos nx + i \sin nx$, and then use this result to obtain the double-angle formulae $\sin 2x = 2 \sin x \cos x$ and $\cos 2x = \cos^2 x - \sin^2 x$.

Problem 9. Find the general solution to the following ODE, using the ansatz $y(t) = e^{\lambda t}$ and reduction of order.

$$t\frac{d^2y}{dt^2} - (1+3t)\frac{dy}{dt} + 3y = 0$$

Problem 10. Find two linearly independent solutions of

$$t^2\frac{d^2y}{dt^2} + \alpha t\frac{dy}{dt} + \beta y = 0$$

using the ansatz $y(t) = t^{\lambda}$. You can assume the solutions for λ are distinct.