Homework #8 **Math 527, UNH spring 2015**
Due Tuesday, March 31 in recitation.

Problem 1: Use the power series expansions of $\sin x$ and $\cos x$ to show that

$$\frac{d}{dx}\cos x = -\sin x$$

That is, differentiate the power series of $\cos x$ and show it equals the power series of $-\sin x$.

Problem 2: Find the general solution of the ODE using the ansatz $y = e^{\lambda x}$, and then find it again using the power series method.

$$y'' + k^2 y = 0$$

Problems 3,4: Find the two linearly independent power-series solutions of the ODE, centered about $x = 0$. If the power series does not simplify to a known function or have a simple expression for the coefficients, provide the first four terms of each solution. Specify the region on which the power series solutions are guaranteed to converge.

3. $(x^2+1)y'' - 6y = 0$ (Zill 6.1 #26)

4. $y'' - (x+1)y' - y = 0$ (Zill 6.1 #25)

Problems 5,6,7: Use Laplace transforms to solve the initial value problems.

5. $y' + 6y = e^{4t}, \quad y(0) = 2$ (Zill 7.2 #33)

6. $y'' + 5y' + 4y = 0, \quad y(0) = 1, \quad y'(0) = 0$ (Zill 7.2 #35)

7. $y'' - 4y' = 6e^{3t} - 3e^{-t}, \quad y(0) = 1, \quad y'(0) = -1$ (Zill 7.2 #36)