Homework #7   Math 527, UNH fall 2015
Due Thursday, March 23 in recitation.
Same instructions as usual regarding writing your name, section number, etc.

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

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

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

Problem 2: Use the power series method to find the general solution of the differential equation. How does it compare to the solution you'd get from the ansatz $y = e^{\lambda x}$?

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

Problems 3,4: Find 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. $y'' - xy = 0$

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

Problem 5: Solve the initial value problem using power series. Specify the region on which the solution is guaranteed to converge.

$$(x - 1)y'' - xy' + y = 0, \quad y(0) = -2, \quad y'(0) = 6$$

Problems 3, 4, and 5 are Zill section 6.1 problems 17, 25, and 29.