Homework Assignment # 1, Due January 13, 2016

1) Is the function \((\cos x) \ln \cos x + x \sin x\) a solution of the ODE \(y'' + y = \sec x\) on the real line \((−∞, ∞)\)? Why? (In other words, explain your reasoning.) What is the order of this ODE? Is this ODE linear or nonlinear?

2) Consider the function \(\tan x\). Find a first order ODE for which this function is a solution on the interval \((0, \pi/2)\). Also find a second order ODE for which this function is a solution on the interval \((0, \pi/2)\).

3) Solve the IVP \((x^2 + 1)y' + 4xy = x, \quad y(2) = 1\).

4) Solve the ODE \(xy' + 3y = 6x^3\) on the interval \(x > 0\).

5) Solve the IVP \(y' - y = \sin 2x, \quad y(0) = 0\).

Also from the text:
Section 1.1: odd numbered Problems 1–7 and 11–17, then 31, 33, 35
Section 1.2: odd numbered Problems 1–13
Section 2.3: Problems 3,7,9,13,17,21,25,31