Complete the following questions on a separate piece of paper. Show all work.
Do not use your notes unless absolutely necessary. If you use your notes please indicate where.
Questions will be gone over at tutoring sessions. Please be prepared.

Worksheet 2

Classifying ODE's and Implicit Differentiation/IVP's

1. Classify the following ordinary differentiation equations (ODE's) by Degree, Order, Linearity, Homogeneity, and variable or constant Coefficients.
   (a) $\frac{dy}{dx} + xy^2 = 1$
   (b) $x\frac{dy}{dx} + y = \sin(x)$
   (c) $e^x\frac{d^2y}{dx^2} + 2dydx + y = 0$
   (d) $y\frac{d^2y}{dx^2} + \frac{dy}{dx} + xy = 1$
   (e) $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$
   (f) $\frac{d^3y}{dx^3} + y = \sin(x)$
   (g) $\frac{d^2w}{dt^2} - w^2\frac{dw}{dt} + w = 0$
   (h) $\frac{d^2v}{dt^2} = t^2v$
   (i) $\frac{d^2y}{dt^2} + y^2 = 0$
2. Show that the following functions are solutions of their following respective ODE's.
   (a) $\frac{dy}{dx} = ay;\ \ y = e^{ax}$
   (b) $\frac{dy}{dx} = y + e^x;\ \ y = xe^x$
   (c) $\frac{dy}{dx} = \frac{x}{\sqrt{x^2+a^2}};\ \ a \neq 0;\ \ y = \sqrt{x^2+a^2}$
   (d) $yy' = e^2x;\ \ y^2 = e^2x$
   (e) $y' = \frac{xy}{x^2+y^2};\ \ 2y^2\ln y - x^2 = 0$
   (f) $y' + y = 0;\ \ y(0) = 2;\ \ y(x) = 2e^{-x}$
   (g) $y' = y^2;\ \ y(0) = 0;\ \ y(x) = 0$