## Assignment First

## January 31, 2013

- 1. For each of this problem, write down the Maple commands to solve the given equations. The answer to part 1a is given below; you must do the others.
  - (a)

$$\begin{aligned} x^{2}y' + xy - y^{2} &= 0 \\ > ode := x^{2} * diff(y(x), x) + x * y(x) - y(x)^{2} = 0 \\ > dsolve(ode, y(x)) \end{aligned}$$

(b)

$$y' = \frac{xy + y^2}{x^2}$$

(c) 
$$y'' + y = x^2 + 2.$$

(d)

$$y" + 4y = 5e^-x.$$

- 2. In each of this problem write down the Maple commands to solve the given initial-value problems. The answer to part 1a is given below; you must do the others.
  - (a)

$$x^{2}y' + xy - y^{2} = 0$$
, subject to  $y(1) = \frac{1}{3}$ .  
>  $dsolve(\{ode, y(1) = 1/3\}, y(x));$ 

(b)

$$y' = \frac{xy + y^2}{x^2}, \text{ subject to } y(1) = \frac{2}{3}.$$
 (c)

$$y' - ty = sin^2 t$$
, subject to  $y(\pi) = 5$ .

3. In each of this problem do the following:

- (a) Find y(3) and plot y(x) for  $1 \le x \le 2$  if y(x) is the solution of the initial value problem  $x^2y' + xy y^2 = 0$ , subject to  $y(1) = \frac{1}{3}$ .
- (b) Show that  $y^2 + x 3 = 0$  is an implicit solution to  $y' = \frac{-1}{2y}$ .
- (c) Show that  $\phi(x) = x^2$  is an explicit solution to xy' = 2y.
- (d) Determine whether the function x = 2cost 3sint is a solution to the differential equation ,  $x^{"} + x = 0$ .
- 4. Plot the direction field for y' = 2x + y. Also sketch the solution curves pass through (0, -2) and (-1, 3) respectively. Don't forget to Put title, color, and label on the graph.
- 5. Draw the direction field for the following differential equations. Sketch some of the solution curves:

(a) 
$$y' = sinx$$

(b)  $y' = x^2 - 2y^2.$ 

(c) 
$$u' = u - x.$$

(d) 
$$y' = \frac{-y}{x}.$$

Best of Luck!