Score:	Name:

HW1 - Due 02/17/2015
ODE - spring 2015

1) Find the trajectory in the (x, x') plan of the following equations

1. $x'' - x = 0$
2. $x'' + sin(x) = 0$

2) Solve the following equations

1. $2t^2xx' + x^2 = 2$
2. $2tx' + t^2 + tx - x = 0$

3) What is the domain of existence of the following equations (the largest interval on which the solution exists)

1. $x' = sin(x) \qquad x(0) = 0$
2. $x' = sin(x) \qquad x(0) = 1/2$
3. $x' = 1/(2x) \qquad x(1) = 1$

4) If $g : \mathbb{R} \to \mathbb{R}$ is Lipchitz and $f : \mathbb{R} \to \mathbb{R}$ is continuous. Show that the system

$$\begin{cases} x' = g(x) \\ y' = f(x)y \end{cases} \tag{1}$$

has at most one solution on any interval, for a given initial value.