Math 274 Homework **Name:** _____

Sections: 2.2,2.3 Point values in boxes.

Due: 16 May 2018

1. Consider the differential equation

$$\frac{dy}{dx} = \frac{x(y^2-1)}{y^2}. \tag{1}$$

(a) [3] Find an implicit general solution to (1).

(b) [1] Find a solution[1] to (1) satisfying $y(0) = 1$.

2. [3] Find an explicit general solution to

$$xy' - 2y = x^3.$$

[1] Did you lose anything in part (a)?

3. [3] Consider the equation

$$\frac{dy}{dx} = \frac{y-x}{x+y}. \tag{2}$$

Equation (2) is neither separable nor linear. Please read the first few pages of Section 2.6 regarding Homogeneous equations. The equation is homogeneous since it can be rewritten as

$$\frac{dy}{dx} = \frac{y/x - 1}{1 + y/x}.$$

Using the substitution $v = y/x$ so that $\dfrac{dy}{dx} = v + x\dfrac{dv}{dx}$ converts (2) into

$$v + x\frac{dv}{dx} = \frac{v-1}{1+v}. \tag{3}$$

Equation (3) is now separable. Find an implicit general solution in terms of v and x.

Using the original substitution $v = y/x$, find an implicit general solution to (2) in terms of the original variables, y and x.