

Activity 2: Sections up to 1.5

Names: _____ Date: September 17, 2009 Score: _____

Show your work for each of the following. You should submit one copy for your group. Feel free to ask your instructor for advice if you need it.

1. (7 pts) Consider the differential equation $y' = 2xy + 3x^2e^{x^2}$

(a) For what initial conditions are you guaranteed a unique solution?

(b) Find as much information as you can about the solution to this differential equation.

(c) Find as much information as you can about the solution to this differential equation with initial condition $y(2) = 1$.

2. (7 pts) Consider the differential equation $\frac{dy}{dx} = \frac{(x-2)y^5}{x^3(4y^3-2y)}$

(a) For what initial conditions are you guaranteed a unique solution?

(b) Find as much information as you can about the solution to this differential equation.

(c) Find as much information as you can about the solution to this differential equation with initial condition $y(2) = 1$.

3. (8 pts) A tank initially contains 100 gallons of pure water. Salty water containing 2 lbs salt per gallon enters the tank at 3 gallons per minute. The perfectly mixed solution leaves the tank at 5 gallons per minute.

(a) Find a formula for the amount of water in the tank after t minutes. Be sure to include the domain on which this formula applies.

(b) Find a formula for the amount of salt in the tank. What is the domain of this function?

(c) When is the amount of salt in the tank smallest? What is that smallest amount? Use this to check your answer in part (b).