Math 217-001 201810
Practice Assignment # 1

1. For each of the following DE, decide whether they are linear and/or separable and state their order. ***Warning:*** *some algebra may be needed before deciding!*

   (a) $y'y = x$

   (b) $y'/y = x$

   (c) $y'' - e^x y' + 2e^x y = 0$

2. (a) Verify that $y = \tan(x + c)$ is a one-parameter family of solutions of the differential equation $y' = 1 + y^2$.

   (b) Is the equation $y' = 1 + y^2$ separable?

   (c) Solve the initial value problem $y' = 1 + y^2$, $y(0) = 1$. What is the interval of definition for the solution?

3. Solve the IVP. *Recall that a solution to an IVP always includes the interval of definition*

   (a) $y' = y + 1$, $y(0) = -3$

   (b) $\dfrac{dy}{dx} = x^3\sqrt{1 - y^2}$, $y(0) = 1$

   (c) $z' = \dfrac{1 - z^2}{1 - x^2}$, $z(2) = 2$.

4. *(this question requires linear equations, which we have not covered yet).* A large mixing tank contains 300 litres of water, in which 50 kg of salt have been dissolved. Brine solution, with a salt concentration of 0.1 kg/litre, is pumped into the tank at a rate of 3 litres per minute. The mixed solution is pumped out at a rate of 2 litres per minute. Determine the amount of salt $A(t)$ in the tank at any given time $t \geq 0$.

5. Tired of studying for Math 217, you decide to drink a can of cold pop. When you go to the kitchen, you find your roommate has drank all the cans from the fridge, and only warm cans are available, sitting at 25 degrees. You put a can in the freezer (which is at -18 degrees), and after 5 minutes its temperature is now 17 degrees. How long should you wait to get the temperature of the can to the ideal 3 degrees?