

Math 217 - September , 2010

- First order linear equations
 - Existence and uniqueness
 - Mixture
 - Substitution
1. A tank 200 gallon tank contains 100 gallons of salt water which contains 10 lbs of salt. A salt solution of 2 lbs salt per gallon enters the tank at a rate of 3 gallons per minute while a flow of fresh water runs into the tank at rate 5 gallons per minute. The well-stirred solution runs out of the tank at rate of 7 gal/min.
 - (a) Find an expression for volume of the tank.
 - (b) At what time does the tank overflow?
 - (c) Write down the differential equation to model the amount of salt in the tank.
 - (d) Find an integrating factor for the linear equation and find the general solution.
 - (e) Find the particular solution to the linear equation.
 - (f) Find the amount of salt in the tank when the tank overflows.
 - (g) What do you expect to happen when $t \rightarrow \infty$?

Lecture Problems

2. Transform the differential equation by using the substitution $v = 2x + y - 3$:

$$\frac{dy}{dx} = (2x + y - 3)^3 - x$$

3. Transform the differential equation by using the substitution $v = \frac{y}{x}$ (this is the homogeneous substitution).

$$\frac{dy}{dx} = \frac{y - 4x}{x - y}$$

4. Solve the previous equation