Math 17B
Vogler
Mixture Problems

EXAMPLE 1 : Let S represent the amount (in pounds) of salt in a tank at time t minutes. A solution containing 2 lbs. of salt per gallon flows into a tank at the rate of 3 gal./min. and the well-stirred mixture flows out of the tank at the same rate. The tank initially holds 500 gallons of solution containing 25 lbs. of salt.

a.) Set up a differential equation with initial conditions representing the rate of change of salt in the tank. Solve the equation.

b.) How much salt is in the tank after 10 minutes ? after 1 hour ?

c.) How much salt do you expect to be in the tank as t gets infinitely large ?

EXAMPLE 2 : Let S represent the amount (in pounds) of salt in a tank at time t minutes. A solution containing 2 lbs. of salt per gallon flows into a tank at the rate of 3 gal./min. and the well-stirred mixture flows out of the tank at the rate of 5 gal./min. The tank initially holds 500 gallons of solution containing 25 lbs. of salt.

a.) How many gallons of solution are in the tank after 1 minute ? after 10 minutes ? after 50 minutes ? after t minutes ? When will the tank be empty ?

b.) Set up a differential equation with initial conditions representing the rate of change of salt in the tank. Solve the equation.

c.) How much salt is in the tank after 10 minutes ? after 100 minutes ? after 200 minutes ? after 240 minutes ?

d.) What will be the maximum of salt in the tank and at what time will it occur ?