

Math 17C

Kouba

Mixture Problems and Systems of Differential Equations

Consider the two tanks containing salt water solutions and connected as shown in the diagram. Tank 1 holds 100 gallons of salt water solution. Tank 2 holds 200 gallons of salt water solution. Let x_1 and x_2 represent the pounds of salt in Tank 1 and Tank 2, resp., at time t . Initially, Tank 1 contains 40 pounds of salt and Tank 2 contains 100 pounds of salt. The mixture in each tank is kept uniform by stirring, and the mixtures are pumped from each tank to the other at the rates indicated in the figure. In addition, fresh water is pumped into Tank 1 at the rate of 20 gal./min.; the mixture leaves Tank 2 at 20 gal./min. Set up and solve a system of differential equations with initial conditions, which represents the amount of salt in each tank.

Let x_1 : lbs. of salt in Tank 1 at time t
 x_2 : lbs. of salt in Tank 2 at time t
 t : minutes

