

Math 16C

Kouba

Application of D.E.'s- A Mixture Problem

EXAMPLE: Let S represent the pounds of sugar in a tank at time t (minutes). A solution containing $1/4$ pound of sugar per gallon flows into the tank at the rate of 8 gal./min. The well-stirred mixture flows out of the tank at the rate of 8 gal./min. Assume that the the tank initially holds 200 gallons of fresh water (no sugar).

- 1.) Set up a Differential Equation with Initial Conditions describing the rate at which S changes.
- 2.) Solve the Differential Equation.
- 3.) Write S explicitly as a function of t .
- 4.) How much sugar is in the tank when
 - i.) $t = 5 \text{ min. ?}$
 - ii.) $t = 25 \text{ min. ?}$
 - ii.) $t = 100 \text{ min. ?}$
- 5.) What is $\lim_{t \rightarrow \infty} S$?