

- I. Your instructor took you on a trip to a small reservoir. The reservoir has a dimension of length 100 *ft*, width 50 *ft*, and depth of 25 *ft*. A heavy rain starts upon your arrival with a steady rate of 0.35 *in* per *hour*, at this time; the reservoir contains 95% of water that initially has 1000 *lb* of a certain concentration chemical dissolved in. At the same time, water from a river nearby is pumped into the reservoir at a rate of 40 *gal/min* containing 2.0 *lb*. of concentration chemical per gallon.
- Write an equation for the reservoir volume and another one of the chemical content in the reservoir.
  - Determine how long will take for the reservoir to be overflow (*hr/min*).
  - After 2.5*hrs*, the rain is stopped and you stopped the water pumped into the reservoir. Determine the volume of the reservoir and how height (*use to the hundredth*) is the water?
  - However, when you turned the water pump off, you have noticed that the meter keeping running for an additional of 30 seconds. The water meter shows the height of the water in the reservoir is 23.871 *ft*. Does your calculation show the same? if it is not what is the difference in *inch(es)* between your calculation and the meter.
  - How many gallons of water are you missing from your calculation?
  - What do you think the cause of the missing water?
  - Your instructor asks you to implement the difference into your calculation. Therefore; rewrite an equation for the reservoir volume and a differential equation of the chemical content in the reservoir in function of *t* disregard the delay.
  - What is the chemical content in the reservoir after 2.5*hrs*?
  - Graph the reservoir volume equation and the differential equation your chemical content.
  - After half hour, the rain starts again with a 0.30 *in* per hour. Determine when the reservoir should be overflow?
- II. While you are making a beef stew for dinner, you realize that you put too much salt into your stew. You found out that a 4% of salt in the stew instead of 1% requirement. To fix this dinner without restart, as you remove salt from the pot at a rate of 1 *oz/min*, then you add beef and potatoes to the pot at a rate of 2 *oz/min*.
- At what time the stew will have you desired concentration of 1% salt where the concentration of the beef stew in the post is given by the term  $C(t)$ .
  - Plot  $C(t)$

$$1 \text{ gal} = 0.133680556 \text{ ft}^3 = 3.7854117 \text{ liters} = 231 \text{ in}^3$$

One inch of rainfall equals 4.7 gallons of water per square yard.