**Math 2214 Sec 2.3 and 2.4 Examples for Lecture**

**Problem 1:** A tank contains 190 gallons of water. Water containing 6 grams of salt per gallon enters the tank at the rate of 4 gallons per minute, and the well mixed solution leaves the tank at the same rate. Initially the concentration of salt in the tank is 4 grams per gallon. Find the equation that gives the amount of salt at any time t. Find the limiting factor for the possible amount of salt in the tank.

**Problem 2:** A tank contains 250 gallons of water. Fresh water enters the tank at the rate of 5 gallons per minute, and the well mixed solution leaves the tank at the same rate. Initially, the concentration of salt in the tank is 9 grams per gallon. Find the equation for the amount of salt in the tank at time t. Find the limiting factor for the possible amount of salt in the tank.

**Problem 3:** A 300 gallon tank initially contains 180 gallons of water in which 8 grams of salt are dissolved. Water containing 9 grams of salt per gallon enters the tank at the rate of 3 gallons per minute, and the well mixed solution leaves the tank at the rate of 1 gallon per minute. Find the equation for the amount of salt in the tank for anytime t. Determine the amount of salt in the tank when the tank is full.

**Problem 4:** A body is found in the town park at 3 pm. The pathologist found the body temperature to be 85 degrees and two hours later it was 68 degrees. The air temperature is 60 degrees. Find the time of death.

**Problem 5:** The population of Blacksburg was 10000 in 1954 and it was 20000 in 1970. The change in population is proportional to the present population. Find equation that gives the population at any time t.

**Problem 6:** A radioactive element decays in proportion to the initial amount. If 60% of the initial amount remains after 50 days find the decay constant and the half-life of this element.

**Problem 7:** Water enters a lake at the rate of 8 cubic kilometers per day. Water evaporates from the lake at the rate of 3.2 cubic kilometers per day, and the dam at the end of the lake regulates the flow so that the volume in the lake stays at a constant 104 cubic kilometers. The water entering the lake contains 4.2 tons of salt per cubic kilometer, and the water leaving the lake is well mixed. Find the equation for the amount of salt in the lake in tons at any time t.