WES Worksheet 5.1 Fall 2018

MATH 222, Week 5

Name: _____

Problem 1. You just graduated and you cash in at your graduation party! You made $3500. You, being incredibly responsible, decide to place all of your money in a savings account where you earn interest on it compounded continuously at a rate of 5%. How much money do you have after 10 years? How long will it take for your investment to double in value? What interest rate would you need for your investment to double in 5 years?

Problem 2. A 100 litre tank is filled with water infested with dangerous bacteria. Clean water is pumped in and infected water is pumped out at a rate of 10 litres per minute, but the bacteria population reproduces at a rate of two percent per minute. Assume that the bacteria are always perfectly uniformly mixed in the water. If the tank begins with a bacteria concentration of one percent at what time will the bacteria population be half of its present value?

Problem 3. A tank begins with 100 litres of salt water in it. Fresh water is pumped in at a rate of twenty litres per minute and the mixed water is pumped out at a rate of ten litres per minute. If the tank initially has ten kilograms of salt in it, find an equation for the amount of salt left in the tank in kilograms as a function of time. Note that the volume of the water in the tank is changing.

Problem 4. A 100 litre vat of water begins with an algae concentration of 1,000 organisms per litre. Suppose that the algae naturally reproduce at a rate of five percent per minute and die at a rate of four percent per minute. If the vat is being drained at a rate of one litre per minute, what will the algae concentration be ten minutes from now? You should assume that the algae are uniformly distributed in the vat. Remember to define your variables with units.