

Homework 1

Due January 15th at the beginning of class, or by 1:50 pm in MATH 602. Justify your answers. Please let me know if you have a question or find a mistake.

1. A population of microorganisms is growing according to the differential equation

$$p'(t) = kp(t),$$

where $p(t)$ denotes the population after t hours, and k is an unknown constant. We saw in class that the general solution to this equation is

$$p(t) = Ce^{kt}.$$

If the population is 10 after 2 hours and 50 after 4 hours, what are the values of C and k ? What was the starting population at $t = 0$? What is the population after 8 hours?

2. Exercises 0.2.4 through 0.2.9 of page 12 of
<https://www.jirka.org/diffyqs/diffyqs.pdf>

Hint: Read section 0.2 of <https://www.jirka.org/diffyqs/diffyqs.pdf> and note that some of the excercises there have solutions at the end.

Extra review

None of this is to be handed in, but if you would like to brush up on algebra or calculus, I recommend looking at some practice problems from <http://tutorial.math.lamar.edu/>, especially from

- <http://tutorial.math.lamar.edu/Problems/CalcI/Functions.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcI/TrigFcns.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcI/TrigEquations.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcI/ExpFunctions.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcI/ExpLogEqns.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcI/CommonGraphs.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcI/ChainRule.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcI/SubstitutionRuleIndefin.aspx>
- <http://tutorial.math.lamar.edu/Problems/CalcII/IntegrationByParts.aspx>

There is a lot of material here, and at a first pass I recommend making sure you can do at least a few of the easiest problems in each section. The main functions for us will be combinations of polynomials, rational functions, exponentials, logarithms, sine and cosine. We will make only limited use of trig functions other than sine and cosine.