Homework 5

Math 147, Fall 2023

This homework is due on Friday, September 22 (at the start of recitation). *Turn in (via Gradescope) your answers to questions 1–3.*

0. Read Sections 3.5 and 4.1. After reading these sections, you should be able to answer the following questions (which are *not* to be turned in).
   - The Intermediate-Value Theorem guarantees (under certain hypotheses) the existence of a number c with $a < c < b$ such that $f(c) = L$. Does it tell you where in the interval (a, b) the number c is, or how many such c exist?
   - What is a secant line? What is a tangent line?
   - What is the derivative of a constant function? The derivative of a linear function?
   - What is the difference between velocity and speed?
   - Are functions with "corners" differentiable?
   - Is a function with a vertical tangent line at $x = 12$ differentiable at $x = 12$?
   - What is the *instantaneous per capita growth rate*?
1. Let r be a positive integer, and let c be a positive real number. Consider the polynomial $f(x) = cx^r - 6x^{r-1} - 6x^{r-2} - \cdots - 6x - 6$.
   (a) Evaluate $\lim_{x\to\infty} f(x)$.
   (b) Use the Intermediate-Value Theorem to explain why $f(x)$ has a positive root.
2. Section 3.5 # 5, 8
3. Section 4.1 # 10, 20, 26, 29, 38
4. (These problems are *not* to be turned in!)
   (a) Section 3.5 # 1, 4, 7
   (b) Section 4.1 # 13, 17, 21, 23, 27, 30, 37