Homework 11

Math 147, Fall 2023

This homework is due on Friday, November 3 (at the start of recitation). *Turn in (via Gradescope) your answers to questions 1–7.*

0. Read Sections 5.2–5.3

1. Does $f(x) = x \ln x$ attain a **global maximum** and a **global minimum** on the interval $[e^{-100}, e^{100}]$? If yes, compute them. If not, explain why not.

2. For each of the following functions, find *all* local extrema (max or min) and *all* global extrema. (*Hint*: ideas from #3 might be useful. Also, you can always check your answer using a graphing calculator.)

   (a) $2x^3 - 3x^2$

   (b) $\frac{1}{3}x^3 + 4x$

   (c) $e^x + \sin x$ with domain $[0, \infty)$

   (d) $e^x + x^x$ with domain $(1, \infty)$

3. These problems pertain to the *discriminant*. You can learn about this topic on page 15 in your textbook.

   (a) Does $x^2 - 5x + 2 = 0$ have a real solution? Explain.

   (b) Does $x^2 - 2x + 5 = 0$ have a real solution? Explain.

   (c) Does $x^2 + 4 = 0$ have a real solution? Explain.

   (d) Is $f(x) = x^2 - 6x + 1$ always positive? Explain.

   (e) Is $f(x) = -x^2 + x + 6$ always negative? Explain.

4. Section 5.1 # 36, 42, 44, 48, 56

5. Section 5.2 # 2, 16, 18, 30, 34, 42

6. Section 5.3 # 8

7. (a) Re-do any problems you missed on Exam 2.

   (b) Write a paragraph reflecting on the exam. *How did you prepare for the exam? Which topics were you most/least confident about? Which problems on the exam did you feel good about? What surprised you about the exam? How do you feel about your performance on the exam? Which types of errors (if any) did you make? How will you prepare for the next exam? Any other reflections or comments?*

8. (These problems are *not* to be turned in!)

   (a) Section 5.1 # 37, 39, 41, 43, 44, 45, 46, 47, 49, 51, 52, 54

   (b) Section 5.2 # 1, 5, 9, 11, 13, 15, 19, 23, 29, 35

   (c) Section 5.3 # 1, 5, 7