

Section 5.1: The First Derivative

Section Objectives:

- Know how to use the first derivative to tell if a function is increasing or decreasing.
- Know the definition of a critical value of a function and how they can be used to find where a function is increasing or decreasing.
- Know the definition of relative (or local) extrema, relative(or local) minimum and relative(or local) maximum and how to find them.

Practice Problems

1. Let $f(x) = 1/3x^3 - 12x + 3$. Find the intervals where f is increasing and decreasing, the relative extrema and sketch a graph of f .

2. Let $f(x) = \frac{x^2}{e^x}$. Find the intervals where f is increasing and decreasing, the relative extrema and sketch a graph of f .

3. Draw a function on the domain $[-1, 6]$ whose derivative is 0 at $x = 2$ and 5 and undefined at $x = 3$ and has a relative minimum at $x = 2$, a relative maximum at $x = 3$ and no relative extrema at $x = 5$.

4. The profit function for a lumber company is given by $P(x) = 3e^{-x^2+4x-4}$ where P is in thousands of dollars and x is tons of lumber sold. How much lumber should they sell to maximize profit?

More Practice from Textbook 5.1: You should do as many problems from each set (1-6, 7-12, 13-42, 49-71, 72-90, 91-96 37-44, 45-48), as needed until you are comfortable with these techniques. 49-71 are good practice for application problems.