3.2 – What does f' Say About f?

Increasing/Decreasing Intervals

Suppose f is continuous on $[a, b]$ and differentiable on (a, b).

- If $f' > 0$ for all x on (a, b), then f is **increasing** on (a, b).

- If $f' < 0$ for all x on (a, b), then f is **decreasing** on (a, b).

Definition of a Critical Number

A **critical number** is an x-value on the domain of a function f such that f' is either zero or undefined.

First Derivative Test

Suppose that c is a critical number for f and that f is differentiable for all values of x on some interval containing c, except possibly at $x = c$.

- If f' changes from positive to negative at c, then f has a **relative (local) maximum** at c.

- If f' changes from negative to positive at c, then f has a **relative (local) minimum** at c.

Find the intervals of increase/decrease and relative extreme values for the following functions. (Any problems not completed in class may be considered additional practice problems.)

1. $h(x) = 5x^3 - 3x^5$

2. $y = x^2 e^x$

3. $g(x) = \dfrac{x^2 + 1}{x^2 - 1}$

4. $f(x) = x^{2/3}(6 - x)^{1/3}$

5. $r(\theta) = \ln(\sin\theta)$ for $0 < \theta < 3\pi$

6. $\psi(x) = \dfrac{3x - 2}{\sqrt{2x^2 + 1}}$