

4.1 Increasing and Decreasing Functions

A function is increasing over an interval if the slopes of the tangents over that interval are positive. Symbolically: If $x_1 < x_2$, then $f(x_1) < f(x_2)$.

A function is decreasing over an interval if the slopes of the tangents over that interval are negative. Symbolically: If $x_1 < x_2$, then $f(x_1) > f(x_2)$.

For a continuous & differentiable function, f , the function values (y-values) are increasing for all x-values where $f'(x) > 0$, and the function values are decreasing for all x-values where $f'(x) < 0$.

Example 1: Graph the following functions. Use the graph to estimate the values of x for which the function values are increasing, and the values of x for which the y-values are decreasing. Verify your estimates with an algebraic solution.

a) $y = x^3 + 3x^2 - 2$

b) $y = \frac{x}{x^2 + 1}$

Example 2: Consider the graph of $f'(x)$. Graph $f(x)$.

