Math 201

Section 4.1 Analysis of Functions I: Increase, Decrease, and Concavity

Let f be defined on an interval, and let x_1 and x_2 denote points in that interval.

(a) f is increasing on the interval if $f(x_1) < f(x_2)$ whenever $x_1 < x_2$.

(b) f is decreasing on the interval if $f(x_1) > f(x_2)$ whenever $x_1 < x_2$.

(c) f is constant on the interval if $f(x_1) = f(x_2)$ for all points x_1 and x_2.

Increasing/Decreasing Test

(a) If $f'(x) > 0$ on an interval, then f is increasing on that interval.

(b) If $f'(x) < 0$ on an interval, then f is decreasing on that interval.

Concavity

A function is called concave upward on an interval I if f' is an increasing function on I. It is called concave downward on I if f' is decreasing on I.

An inflection point is a point where a curve changes its direction of concavity.

Concavity Test

(a) If $f''(x) > 0$ for all x in I, then the graph of f is concave upward on I.

(b) If $f''(x) < 0$ for all x in I, then the graph of f is concave downward on I.