Stewart Section 4.3

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The Increasing/Decreasing Test

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

The First Derivative Test

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The First Derivative Test

Suppose that c is a critical number of a continuous function f.

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

b) If f' changes from negative to positive at c, then f has a local minimum at c.

c) If f' does not change sign at c, then f does not have a local maximum or mimimum at c.

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A function (or its graph) is called **concave downward** on an interval I if f' is an *decreasing* function on I.

Concavity Test

If

$$f''(x) > 0$$

for every x in an interval I, then the graph of f is *concave upward* on I

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for every x in an interval I, then the graph of f is *concave upward* on I

If

$$f''(x) < 0$$

for every x in an interval I, then the graph of f is *concave downward* on I

The Second Derivative Test

Suppose f'' is continuous near c.

If

$$f'(c) = 0 \quad \text{and} \quad f''(c) > 0$$

then f has a *local minimum* at c.

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then f has a *local maximum* at c.