SATPREP

Definition of a Critical Number:

Let f be defined at c. If $f'(c)=0$ or if f' is undefined at c, then c is a critical number of f.

First Derivative Test:

Let c be a critical number of a function f that is continuous on an open interval I containing c. If f is differentiable on the interval, except possibly at c, then $f(c)$ can be classified as follows.

1) If $f'(x)$ changes from negative to positive at c, then $f(c)$ is a **relative minimum** of f.
2) If $f'(x)$ changes from positive to negative at c, then $f(c)$ is a **relative maximum** of f.

Second Derivative Test:

Let f be a function such that $f'(c)=0$ and the second derivative of f exists on an open interval containing c.

1) If $f''(c)>0$, then $f(c)$ is a relative minimum.
2) If $f''(c)<0$, then $f(c)$ is a relative maximum.

Definition of Concavity:

Let f be differentiable on an open interval I. The graph of f is **concave upward** on I if f' is increasing on the interval and **concave downward** on I if f' is decreasing on the interval.

Test for Concavity:

Let f be a function whose second derivative exists on an open interval I.

1) If $f''(x)>0$ for all x in I, then the graph of f is concave upward in I.
2) If $f''(x)<0$ for all x in I, then the graph of f is concave downward in I.

Definition of an Inflection Point:

A function f has an inflection point at $(c, f(c))$

1) if $f''(c)=0$ or $f''(c)$ does not exist and
2) if f'' changes sign at $x=c$. (or if $f'(x)$ changes from increasing to decreasing or vice versa at $x=c$)