

How to Find a Local Maximum and Local Minimum of a Function

A. Local Maximum and Minimum Values

1. Find the critical numbers of f - that is the numbers c where $f'(c) = 0$ or $f'(c)$ does not exist.
2. Create a testing table with the first row including critical values c with an ascending order to the right. (see below)
3. The second row is for $f'(x)$. At any critical values c , $f'(c)$ should be either 0 or DNE according to how you find the values in #2.
4. The third row is for the behavior of $f(x)$. Use the First Derivative Test for a value between those between critical values. If the interval that f' is positive, then f is increasing, and the interval on which f' is negative, then f is decreasing. Use arrows to note the behavior of f .
5. If f' changes from positive to negative at a critical number c , then $f(c)$ is a local maximum. If f' changes from negative to positive at c , then f is a local minimum.

x	
$f'(x)$	
$f(x)$:inc/dec	

B. Concavity and Points of Inflection

Compute f'' and use the Concavity Test. The curve is concave upward where $f'' > 0$ and concave downward where $f'' < 0$.

Inflection points occur where the direction of concavity changes.

x	
$f''(x)$	
$f(x)$:CU/CD	

Guidelines for Sketching a Curve $f(x)$

1. Find Domain ☐ Vertical Asymptotes
2. The x - and y -intercepts
3. Symmetry
4. Horizontal Asymptotes: Find limit of $f(x)$ as $x \rightarrow \infty$ and $x \rightarrow -\infty$
5. Local Max/Min (See part A)
6. Concavity and Points of Inflection (See part B)
7. Plot points in #2, #5, #6 and asymptotes
8. Then sketch the curve.