

Local Extreme Values

Note that an absolute extremum is *also* a local extremum.

Theorem

If a function f has a local minimum or maximum at an interior point c of its domain, and if f' exists, then $f'(c) = 0$.

Definition

A point c in the interior of the domain of f is a **critical point** if $f'(c) = 0$ or $f'(c)$ doesn't exist.

Notes

Finding Absolute Extrema

Example

Find the absolute minimum and maximum of $y = x^{2/3}$ on the interval $[-2, 3]$

Solve graphically: Use graphing calculator with window size $[-2,3]$ by $[-1,3]$

Confirm analytically:

x	y	Type
-2	$(-2)^{2/3} = \sqrt[3]{4}$	Left endpoint
0	0	Critical point
3	$3^{2/3} = \sqrt[3]{9}$	Right endpoint

$$y' = \frac{2}{3\sqrt[3]{x}}$$

Notes

Strategy For Finding Extrema

- Find the critical points
- Build a table.
The x-values will be the critical points and the left and right endpoints.
- Calculate the y-values for each entry in the table.
If y does not exist, write 'DNE'
- A critical point is a maximum if points close to it on both sides have a smaller y value.
- A critical point is a minimum if points close to it on both sides have a larger y value.

Notes