4.2 Critical Points, Local Max, Local Min

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The first derivative test: Assuming $f'(c) = 0$
If $f'(x)$ changes sign from negative to positive at $x = c$, then $f(x)$ has a local minimum at $x = c$

4.2 Critical Points, Local Maxima + Local Minima

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- For a function $f(x)$, a critical number is a number, c, in the domain of $f(x)$ such that $f'(x) = 0$ or $f'(x)$ is undefined. As a result, $(c, f(c))$ is called a critical point and usually corresponds to local or absolute extrema.

First Derivative Test

Let c be a critical number of a function f.
When moving through x-values from left to right:

- $f'(x) \to (-) \to (+)$ - local min
- $f'(x) \to (+) \to (-)$ - local max
- $f'(x) \to$ doesn't change sign - neither

Algorithm for finding local max and local min values of a function f

1) Find critical numbers of the function (that is, determine where $f'(x) = 0$ and where $f'(x)$ is undefined for all x-values of domain of f
2) Use the first derivative to analyze whether f is ↑ or ↓ on either side of each critical number
3) Conclude whether each critical number locates a local max value of the function f, a local min value, or neither