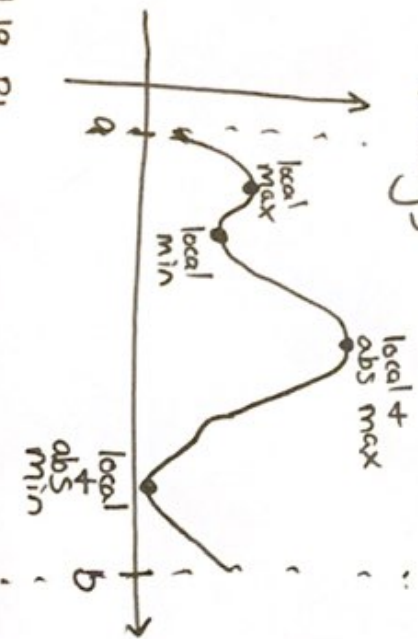


Lesson 19: Section 4.1

Goal: Find maximum and minimum values of a function on an interval $[a, b]$.

- absolute maximum/minimum is ~~the~~ the highest/lowest point of the function on the whole interval

- relative (local) maximum/minimum is the highest point/lowest point relative to nearby points (on the graph, it looks like the top of a hill or bottom of a valley)



L19 P1

Extreme Value Theorem:

A function that is continuous on a closed interval has an absolute max and absolute min on the interval.

Local Extreme Value Theorem:

If f has a local max or min at $x=c$ and $f'(c)$ exists, then $f'(c) = 0$.

Possible Locations of Absolute Maximums and Minimums

- The endpoints of the closed interval
- Places where $f'(x) = 0$
- Places where $f'(x)$ is undefined (DNE)

- A critical point for the function f is a point $x=c$ in the domain of f such that $f'(c)=0$ or $f'(c)$ undefined (DNE)

Finding Absolute Extrema on $[a,b]$

1. Find the critical points of f
2. Plug the endpoints a and b and the critical points from Step 1 into f .
3. Choose the largest and smallest values from Step 2.

Practice Problems

1. Find the critical points of $f(x) = \frac{1}{x} + \ln(x)$.
2. Find the absolute extrema of $f(x) = x^2 + \cos^{-1}(x)$ on $[-1,1]$.