Finding Extreme Points: Takeaways ⤴

Concepts

- A derivative is the slope of the tangent line at any point along a curve.

- Let   be a point on the curve and   be the distance between two points, then the mathematical formula for the slope as h approaches zero is given as:

- Differentiation is the process of finding a function's derivative.

- Finding the derivative of: :

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- Three ways of notating a curve's derivative:

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    -                          *Only use if derivative is a function

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- A critical point is a point where the slope changes direction from negative slope to positive slope or vice-versa. Critical points represent extreme values, which can be classified as a minimum or extreme value.

- Critical points are found by setting the derivative function to   and solving for

- Critical point classification:

    - When the slope changes direction from positive to negative it can be a maximum value.

    - When the slope changes direction from negative to positive, it can be a minimum value.

    - If the slope doesn't change direction, like at   for   , then it can't be a minimum or maximum value.

- Each maximum or minimum value points are known as local extrema.
- Classifying local extrema:
  - A point is a relative minimum if a critical point is the lowest point in a given interval.
  - A point is a relative maximum if a critical point is the highest point in a given interval.
- Instead of using the definition of the derivative, we can apply derivative rules to easily calculate the derivative functions.
- Derivative rules:
  - Power rule: Let   be some power, then
    - Example: Let   In our function,   would be 2. Using the power rule, it's derivative would be   or
  - Sum rule:
    - Example:
  - Constant factor rule:
- Derivative of   is always   and derivative of   is always   .
- Once you found the critical points of a function, you can analyze the direction of the slope around the points using a sign chart to classify the point as a minimum or maximum. We can test points around our points of interest to see if there is a sign change as well as what the change is.

Resources

- [Derivative rules](#)
- [Sign chart](#)