

MATH 150

Today

1. Go over Exam I
2. 3.1: The Mean Value Theorem
3. Homefun

Goals:

1. Critical points (Understand which points are critical points)
2. Local Extrema (Understand what local extrema are and that they can only occur at critical points)
3. Rolle's Theorem/The Mean Value Theorem (Understand what the Mean Value Theorem means)

Where is today's material used?

1. The Mean Value Theorem mostly appears in mathematics, where it plays an important role in several results including the Fundamental Theorem of Calculus.
2. Using critical points to find local extrema is a technique that appears in math, physics, chemistry, economics, and any discipline requiring optimization.

3.1 The Mean Value Theorem

1. Local Extrema (Local max at $x = a$: $f(a) > f(x)$ for x near a ; local min at $x = a$: $f(a) < f(x)$ for x near a)
2. Critical points ($x = c$ (in the domain of f) is a critical point if $f'(c) = 0$ or does not exist)

3. **Theorem:** (Candidate Theorem) If $x = c$ gives a local extremum of f , then $x = c$ is a critical point of f .
4. **Theorem:** (Rolle's Theorem) If f is continuous in $[a, b]$ and differentiable on (a, b) and $f(a) = f(b) = 0$, then there is a number $c \in (a, b)$ such that $f'(c) = 0$.
5. **Theorem:** (The Mean Value Theorem) If f is continuous in $[a, b]$ and differentiable on (a, b) , then there is a number $c \in (a, b)$ such that
$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$
6. Examples. p. 231: 25, 27, 29, 31, 32, 34, 40, 44, 52, 53, 55, 57

Next Time

1. Watch 3.2: Curve Sketching 1 [34 min]