

Rolle's Theorem

Suppose f is continuous on $[a, b]$ and differentiable on (a, b) . If $f(a) = f(b)$, then there exists a number c in (a, b) such that $f'(c) = 0$.

Mean Value Theorem

If f is continuous on $[a, b]$ and differentiable on (a, b) , then there exists a number c in (a, b) such that

$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$

Increasing/decreasing functions — Definition

Suppose the function f is defined on an interval I .

- If for any two points x_1 and x_2 in I ,

$$x_1 < x_2 \implies f(x_1) < f(x_2),$$

then f is increasing on I .

- If for any two points x_1 and x_2 in I ,

$$x_1 < x_2 \implies f(x_1) > f(x_2),$$

then f is decreasing on I .

Increasing/decreasing functions — Theorem

If f is differentiable at each point of (a, b) and the derivative is positive at each point, then f is increasing on (a, b) .

If f is differentiable at each point of (a, b) and the derivative is negative at each point, then f is decreasing on (a, b) .