

4.2: The MVT

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Rolle's Thm. Let f be a fcn that satisfies the following three hypothesis:

(1) f const. on $[a, b]$

(2) f diff on (a, b)

(3) $f(b) = f(a)$

Then, $\exists c \in (a, b)$ s.t. $f'(c) = 0$

ex1: show $x^3 + e^x = 0$ has exactly 1 real root.

MVT: Let f be a fcn that satisfies the following 3 hypothesis:

(1) f const on $[a, b]$

(2) f is diff on (a, b)

Then, $\exists c \in (a, b)$ s.t. $f'(c) = \frac{f(b) - f(a)}{b - a}$

ex2: verify the MVT of $f(x) = x^3 - 3x + 2$ on $[-2, 2]$

ex3: suppose $3 \leq f'(x) \leq 5 \quad \forall x \in \mathbb{R}$. show $18 \leq f(5) - f(2) \leq 30$

Thm: If $f'(x) = 0 \quad \forall x \in (a, b)$, then f is const on (a, b) .

Corollary: If $f' = g' \quad \forall x \in (a, b)$, then $f - g$ is const on $(a, b) \dots f(x) = g(x) + c$.