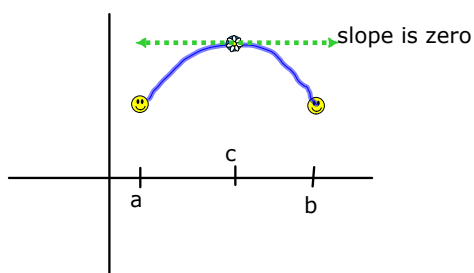


3.2 Rolle's Theorem & Mean Value Theorem

Rolle's Thm

Let $f(x)$ be continuous on $[a, b]$ and differentiable on (a, b) .

If $f(a) = f(b)$, then there is at least one number 'c' in the interval such that $f'(c) = 0$



Nov 8-9:11 AM

ex1) Find the 2 x-intercepts of $f(x) = x^2 - 3x + 2$ and show that $f'(c) = 0$ for some point between the intercepts.

$$0 = x^2 - 3x + 2 \quad f' = 2x - 3 = 0$$

$$x = 1, 2 \quad f(1) = 0 \quad f(2) = 0$$

$$[1, 2] \quad \boxed{x = \frac{3}{2}}$$

- 1) Find Interval $[a, b]$
- 2) $f(a) = f(b)$
- 3) Deriv. $f'(x) = 0$
- 4) solve for x in $[a, b]$

Nov 8-9:19 AM

ex2) $f(x) = x^4 - 2x^2$
Find all numbers on the interval $(-2, 2)$ such that $f'(c) = 0$

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

$$f(-2) = 8 \quad f'(c) = 0$$

$$f(2) = 8 \quad 4x^3 - 4x = 0$$

$$4x(x^2 - 1) = 0$$

$$\boxed{x = 0, \pm 1}$$

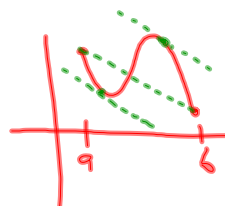
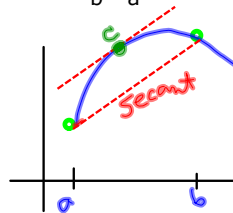
Nov 8-9:24 AM

Mean Value Theorem (MVT)

If $f(x)$ is continuous on $[a, b]$ and differentiable on (a, b) ,

then there exists some number 'c' such that

$$f'(c) = \frac{f(b) - f(a)}{b - a} \quad f' = \text{Avg. ROC}$$



Nov 8-9:29 AM

ex) $f(x) = 5 - 4/x = 5 - 4x^{-1}$

Find all numbers on $[1,4]$ guaranteed by MVT

$$f'(x) = \frac{f(4) - f(1)}{4 - 1}$$

$$4x^{-2} = \frac{4 - 1}{4 - 1}$$

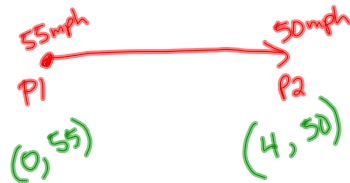
$$\frac{4}{x^2} = 1 \rightarrow 4 = x^2$$

$$x = \pm 2$$

$$\boxed{x = 2}$$

Nov 8-9:35 AM

ex) 2 patrol cars are 5 miles apart.
P1 clocks you at 55 mph.
4 minutes later P2 clocks you at 50 mph.
Prove that you exceeded the 65 mph speed limit during those 4 minutes.



Nov 8-9:40 AM

P 167

3-9, 21, 22,

27-32, 44, 47-50

Nov 8-9:46 AM