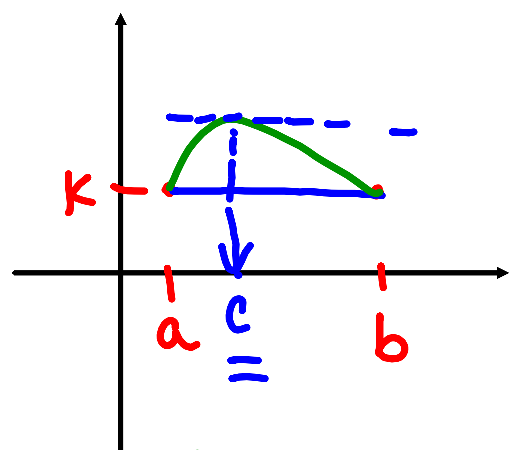
Mean value thm

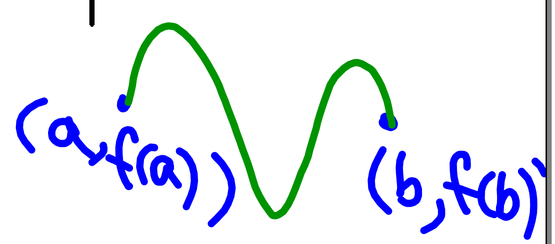
L'hopitals rule

Optimization

Roll's thm

when $f(x)$ is continuous & diff. for $[a, b]$, where $f(a)=f(b)$, there must be c where $f'(c)=0$ & $a<c<b$





$y = 2(x-5)^2 - 3$

Find c for $[1, 9]$

where Roll's Thm applies for $f(1)$ & $f(9)$

$f(1) = 29$

$f(9) = 29$

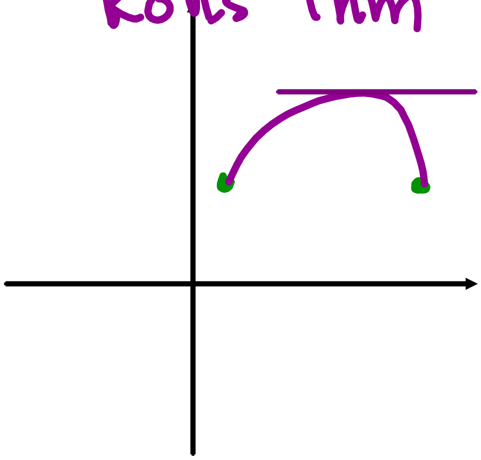
$f'(c) = 0$

$y' = 4(x-5) = 0$

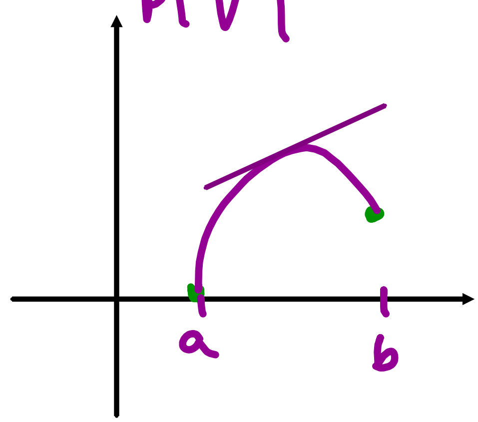
$x = 5$

$\boxed{c = 5}$

Rolls thm



MVT



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

$a<c<b$

MVT

Given. $f(x)$ is cont. & diff.

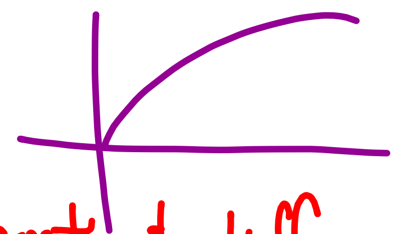
over $[a, b]$, there exists c

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

where $a < c < b$

Let $y=\sqrt{x}$. for $0 \le x \le 9$

Find c that satisfy MVT for $[0,9]$.



since $y=\sqrt{x}$ is cont. & diff over $[0,9]$, $f'(c)=\frac{f(9)-f(0)}{9-0}$

$$f'(x)=\frac{1}{2\sqrt{x}}\Big|_{x=c}=\frac{1}{2\sqrt{c}}=\frac{3-0}{9}=\frac{1}{3}$$

$$\frac{1}{2\sqrt{c}}=\frac{1}{3}$$

$$2\sqrt{c}=3 \rightarrow \sqrt{c}=\frac{3}{2}$$

$$c=\frac{9}{4} \checkmark$$