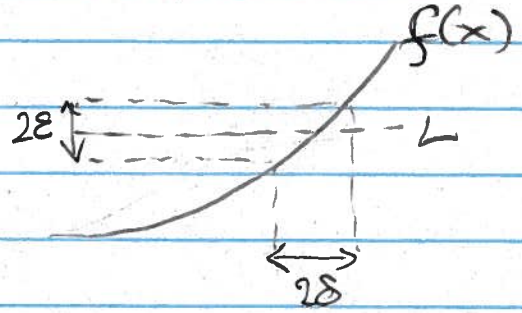
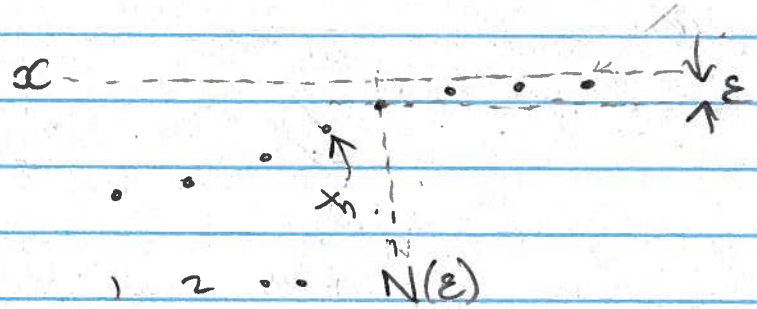
Lecture 1 · Review of Calculus.

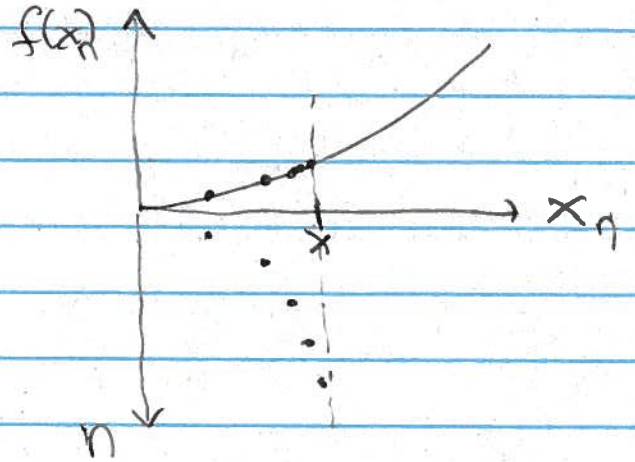
LIMIT (OF FUNCTION)



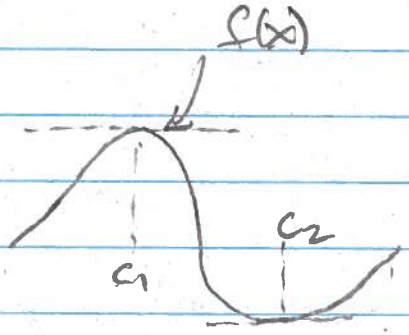
LIMIT (OF SEQ)



TEST OF CONTINUITY

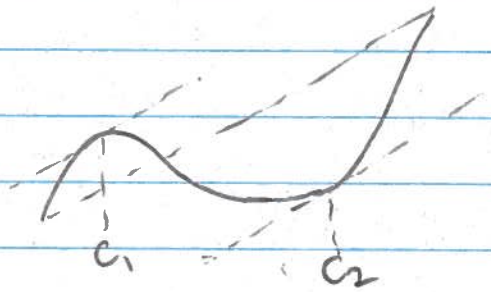


Rolle's Theorem



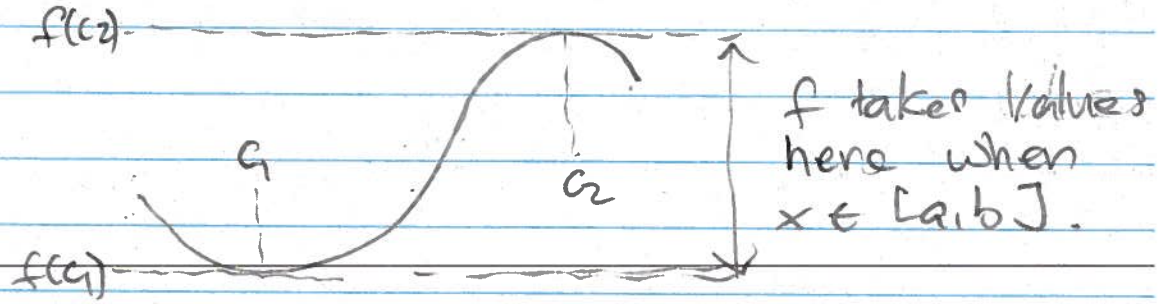
$f(a) = f(b) \Rightarrow$ function must "turn over" at least once.

MVT

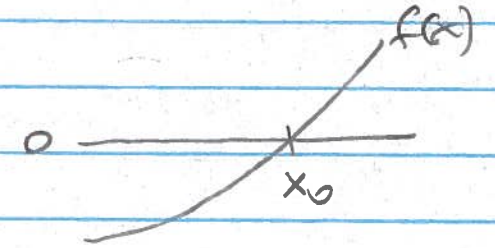


→ Generalization of Rolle's Theorem.

Extreme-value thm



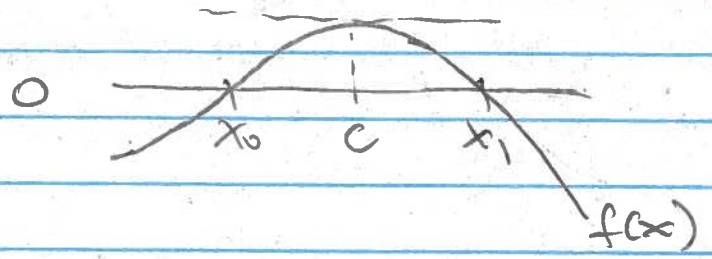
Generalized Rolle's Thm.



$\Rightarrow \quad n=0.$

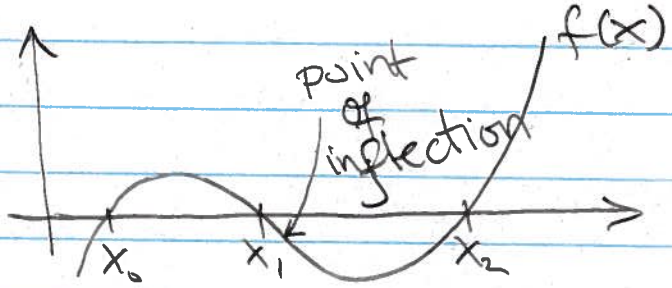
$\Rightarrow \quad \exists\, c \in (x_0, x_0) \text{ s.t. } f^{(0)}(c) = f(c) = 0.$

ie. $c = x_0$ & $f(x_0) = 0$ ✓



$\Rightarrow \quad n=1$

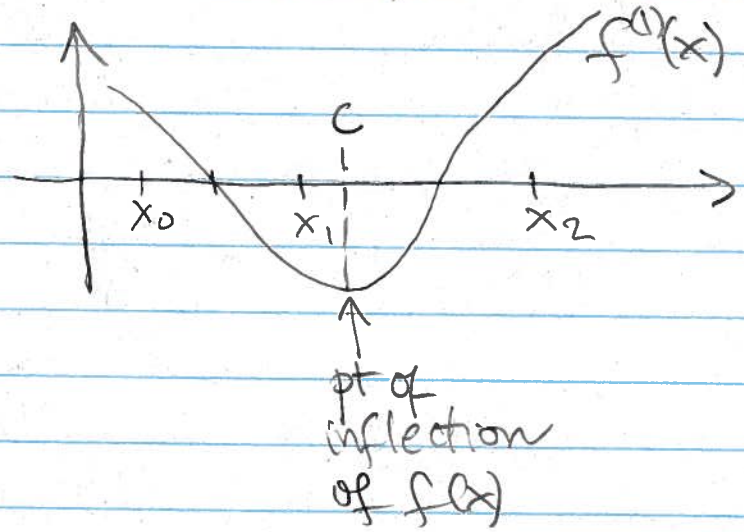
$\Rightarrow \quad \exists\, c \in (x_0, x_1) \text{ s.t. } f^{(1)}(c) = 0.$ ✓



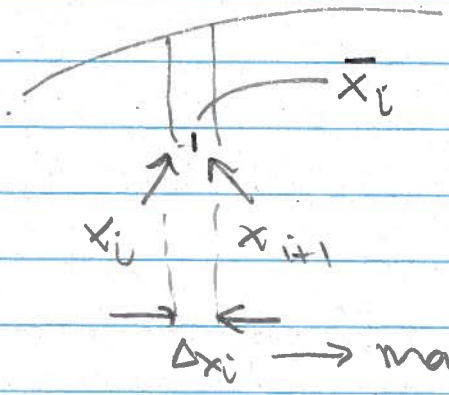
Rolles Thm (Generalized) $\Rightarrow$

$n = 2$

$\Rightarrow \exists\, c \in (x_0, x_2)$ s.t. $f^{(2)}(c) = 0$

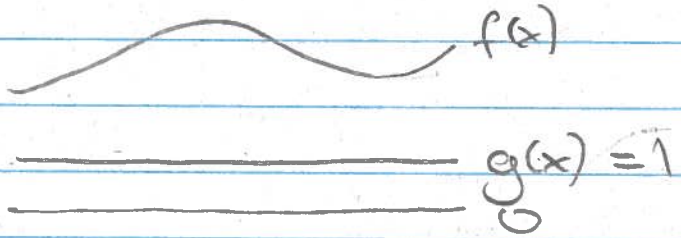


Riemann Integral

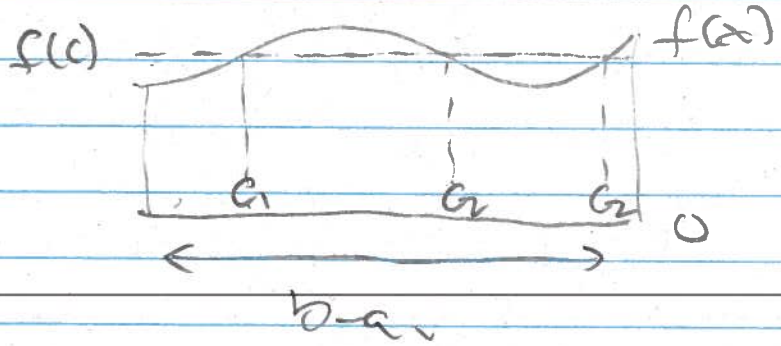


$\Delta x_i \rightarrow$ make the largest of these go to zero.

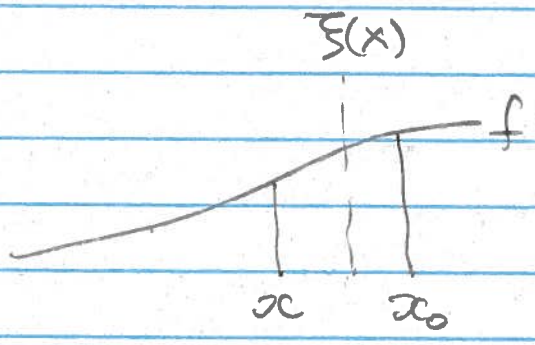
Weighted MVT



$$\int_a^b f(x)\,dx = f(c)(b-a).$$



Taylor



$$f(x) = P_n(x) + R_n(x).$$

$P_n(x)$: x_0.

$R_n(x)$: $\xi(x), x_0$