Theorem: suppose $f : [a,b] \to$R and suppose f has either a local maximum or a local minimum at x $\in$(a,b).if f is differentiable at x then

$f'(x) = 0$

proof:suppose f has a local maximum at x $\in$(a,b).For small (enough) h, $f(x+h) \leq f(x)$.

if $h > o$ ten

$$\frac{f(x+h) - f(x)}{h} \leq 0$$

similarly, if $h < 0$,then

$$\frac{f(x+) - f(x)}{h} \geq 0$$

By elementry properties of the limit, if follow that $f^{'}(x) = 0$