Mean Value Theorem (Section 5.2)

* MVT: states that if $f(x)$ is continuous on a closed interval $[a,b]$ AND differentiable at every point on the open interval (a,b), then there is at least one point "c" where:

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

tangent line @ point "c"

secant line between a & b.

ex: $f(x)=x^2$ from $[0,2]$. Find the value of c.

$f'(x)=2x$

$f'(c)=2c$

$m=\frac{f(2)-f(0)}{2-0}=\frac{2^2-0^2}{2}=2$

$\therefore 2c=2$

$c=1$

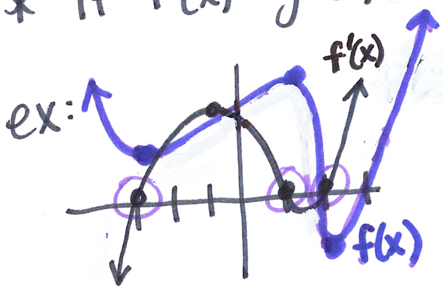
So... when $x=1$ the $m=2$ & is // to the secant line from $(0,0)$ to $(2,4)$.

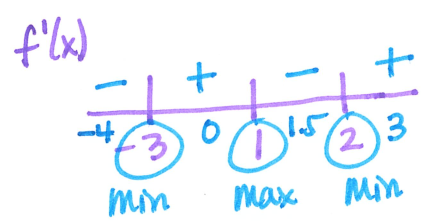
* If $f'(x)>0$, then $f(x)$ is increasing.
  If $f'(x)<0$, then $f(x)$ is decreasing.

intervals are x-values!

* If $f'(x)=0$ for every x in the interval, then $f(x)=c$
* If $f'(x)=g'(x)$ for every x in the interval, then $f(x)=g(x)+c$

ex:





Local Max: @ $x=1$

Local Min: @ $x=-3,2$

Incr: $(-3,1)\cup(2,\infty)$

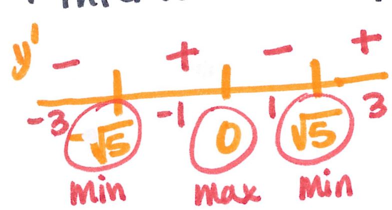
Decr: $(-\infty,-3)\cup(1,2)$

#22 $y=x^4-10x^2+9$ Find all local extrema & intervals of inc/dec.

$y'=4x^3-20x=0$

$4x(x^2-5)=0$

$x=0,\ \pm\sqrt{5}$



Local min: $y(\sqrt{5})=-16$

Local max: $y(0)=9$

Incr: $(-\sqrt{5},0)\cup(\sqrt{5},\infty)$

Decr: $(-\infty,-\sqrt{5})\cup(0,\sqrt{5})$