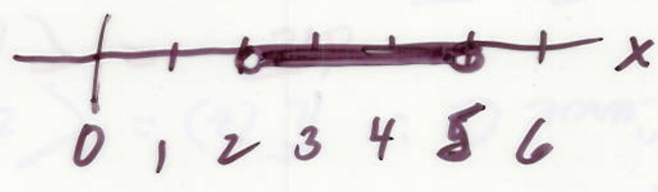
M 191 Lect #11 2-28-11

Chapter 4 Applications of the Derivative

Terminology

Open interval $(2,5)$



described $2 < x < 5$

Closed interval $[2,5]$

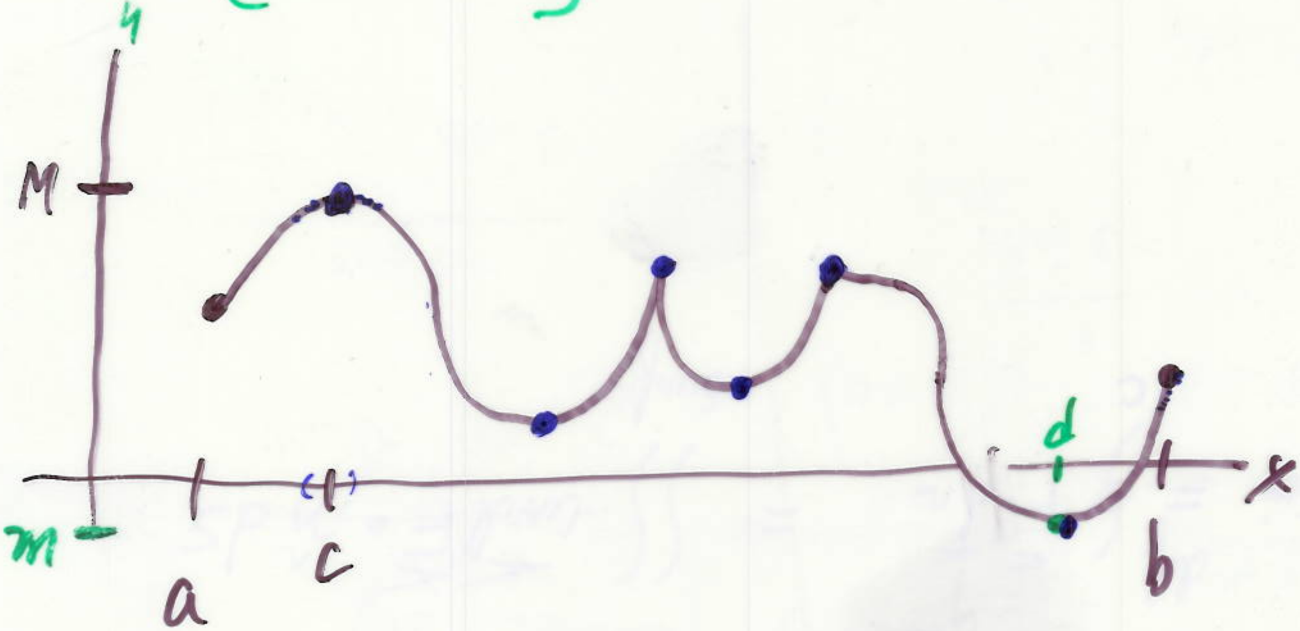
described $2 \le x \le 5$

Let f be a function defined on an interval (open or closed) from a to b

Absolute Max (Min)

f has an absolute $\begin{Bmatrix}\text{max}\\ \text{min}\end{Bmatrix}$ on the interval a to b if there is some points $\begin{Bmatrix}c\\ d\end{Bmatrix}$ between a and b such that

$$\begin{Bmatrix} f(c) \geq \\ f(d) \leq \end{Bmatrix} f(x) \text{ for all values of } x \text{ in the interval}$$



Abs $\begin{Bmatrix}\text{max}\\ \text{min}\end{Bmatrix}$ of f is $\begin{Bmatrix}M\\ m\end{Bmatrix}$ and occurs @ $x = \begin{Bmatrix}c\\ d\end{Bmatrix}$.

Abs Extrema are the abs maxes & abs mins local

Relative Extrema

Relative $\left\{\begin{matrix}\text{Maximum} \\ \text{Minimum}\end{matrix}\right\}$ A function defined on a open interval has a relative $\left\{\begin{matrix}\text{max} \\ \text{min}\end{matrix}\right\}$ at $\left\{\begin{matrix}x=c \\ x=d\end{matrix}\right\}$ if there is a open subinterval about $\left\{\begin{matrix}c \\ d\end{matrix}\right\}$ such that $\left\{\begin{matrix}f(c) \geq \\ f(d) \leq\end{matrix}\right\} f(x)$ for all x in the subinterval.

The blue dots in the graph on the previous page are the relative extrema.

Let's attempt to find all Abs + Rel Extrema for numerical data.

			at				at					at		
X:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Y:	7	9	10	8	6	4	3	5	8	11	16	17	14	12
			Rel max				Abs min m Rel min					Abs Max M Rel Max		

Behaviors	Fcn def.	F cont	F diff
Smoothies	yes	yes	yes
Corners	yes	yes	no
Cusps	yes	yes	no
V tans	yes	yes	no
Jump	• yes	no	no
Hole	○ no	○ no	no
Dots	⊙ yes	~~⊙~~ ?	no
V asy	• yes	no	no