If I don't have your Unit 4 homework, get out your outline so I can check your homework off and collect your outline.

Work on the problem below...

Happy Birthday

Tilda!

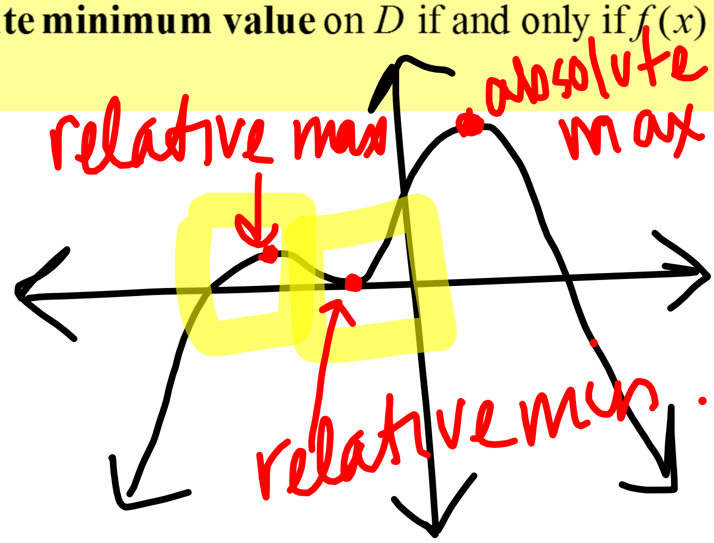
5.1 Extreme Values of Functions

Absolute Extreme Values

Let f be a function with domain D. Then $f(c)$ is the

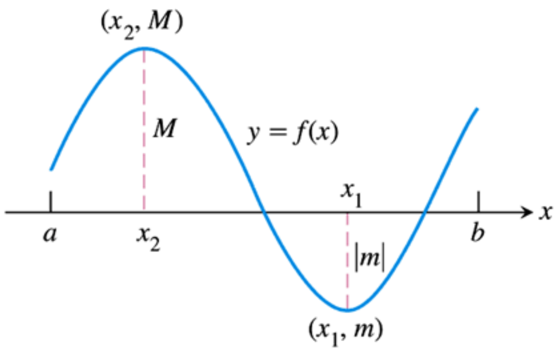
(a) absolute maximum value on D if and only if $f(x) \le f(c)$ for all x in D.

(b) absolute minimum value on D if and only if $f(x) \ge f(c)$ for all x in D.

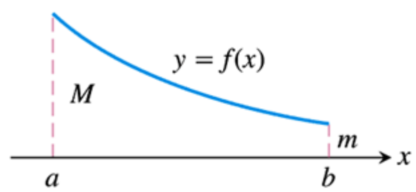


The Extreme Value Theorem EVT

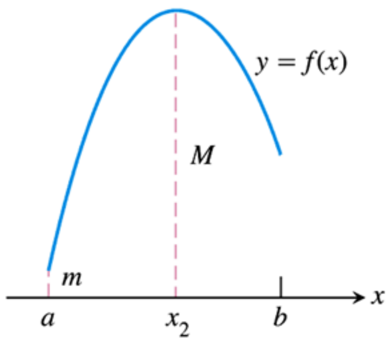
If f is continuous on a closed interval $[a, b]$, then f has both a maximum value and a minimum value on the interval.



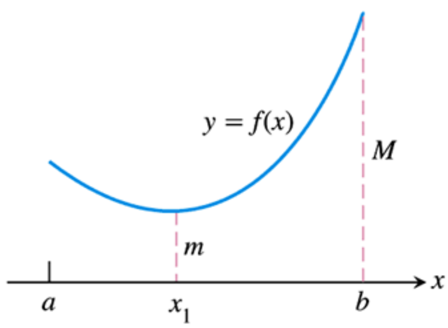
Maximum and minimum at interior points



Maximum and minimum at endpoints

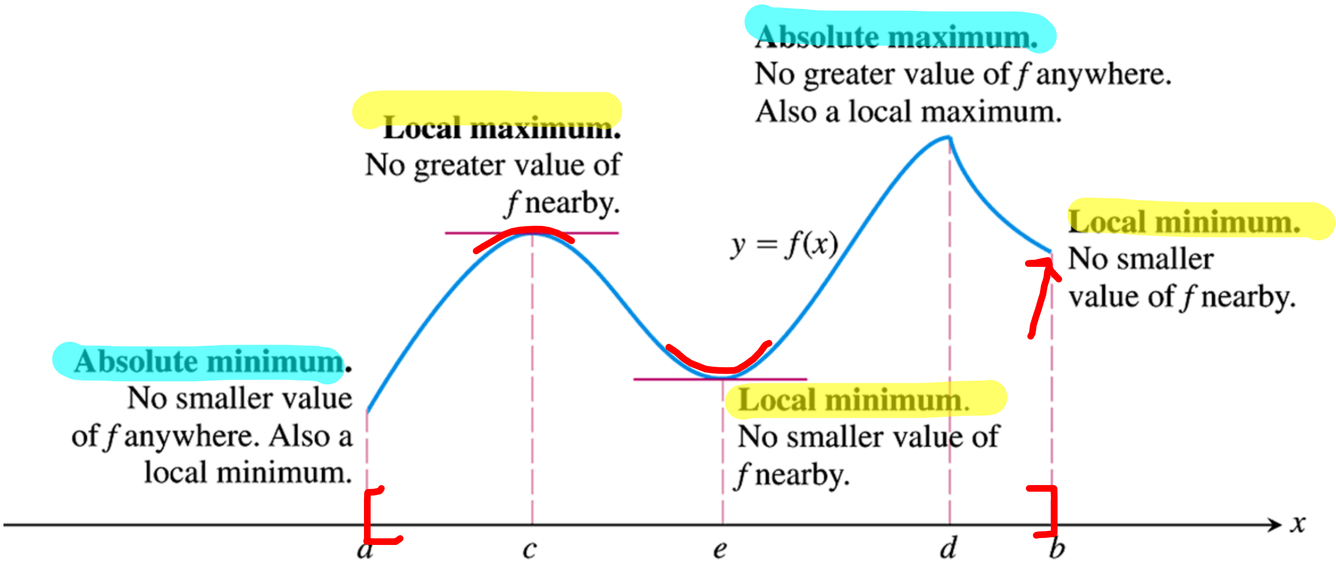


Maximum at interior point, minimum at endpoint



Minimum at interior point, maximum at endpoint

Classifying Extreme Values



closed interval [a, b]

Local Extreme Values

Let c be an interior point of the domain of the function f. Then $f(c)$ is a
(a) local maximum value at c if and only if $f(x) \le f(c)$ for all x in some open interval containing c.
(b) local minimum value at c if and only if $f(x) \ge f(c)$ for all x in some open interval containing c.

A function f has a local maximum or local minimum at an endpoint c if the appropriate inequality holds for all x in some half-open domain interval containing c.

horizontal tan lines @ local mins & local maxs

If a function f has a local maximum value or a local minimum value at an interior point c of its domain, and if f' exists at c, then $f'(c) = 0$.

Critical Points

A point in the interior of the domain of a function f at which $f' = 0$ or f' does not exist is a **critical point** of f.

Nov 15-2:36 PM

Examples

1. Find all local and global extrema of $f(x)=\frac{1}{3}x^3-\frac{5}{2}x^2-14x+7$.

2. Find all absolute and relative extrema of $g(x)=\begin{cases}5-2x^2 & , \ x\le 1\\ x+2 & , \ x>1\end{cases}$.

3. Find all global and local extrema of $h(x)=\frac{x}{1+x^2}$.

Examples

1. Find all local and global extrema of $f(x)=\frac{1}{3}x^3-\frac{5}{2}x^2-14x+7$.

$f'(x)=x^2-5x-14$

$0=x^2-5x-14$

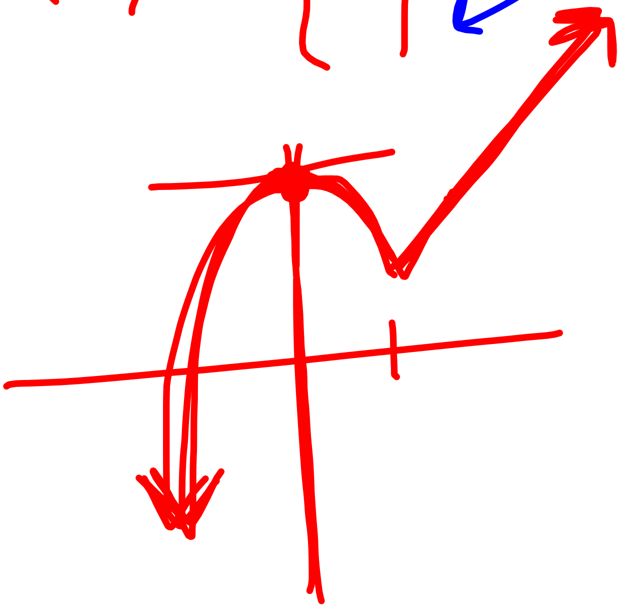
$0=(x-7)(x+2)$

$x=7,-2$

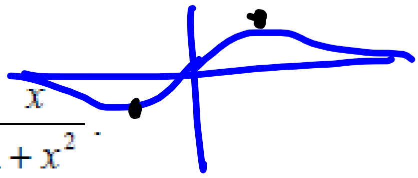
2. Find all absolute and relative extrema of $g(x)=\begin{cases} 5-2x^2 & , \ x \le 1 \\ x+2 & , \ x > 1 \end{cases}$.

$$g'(x) = \begin{cases} -4x \\ 1 \end{cases} \rightarrow \frac{0}{-4} = \frac{\cancel{-4}x}{\cancel{-4}}$$

$$0 = x$$



3. Find all global and local extrema of $h(x) = \frac{x}{1+x^2}$.



$$h'(x) = \frac{(1+x^2)\cdot 1 - x(2x)}{(1+x^2)^2}$$

$$h'(x) = \frac{1+x^2-2x^2}{(1+x^2)^2} = \boxed{\frac{-x^2+1}{(1+x^2)^2}}$$

$$0 = -x^2+1$$

$$x^2 = 1$$

$$x = \pm 1$$

Just set numerator equal to 0.

$$\frac{0}{m} = 0$$

Homework

5.1 pg.198 #3-30 (X3), 35, 37, 40

Oct 21-8:47 AM