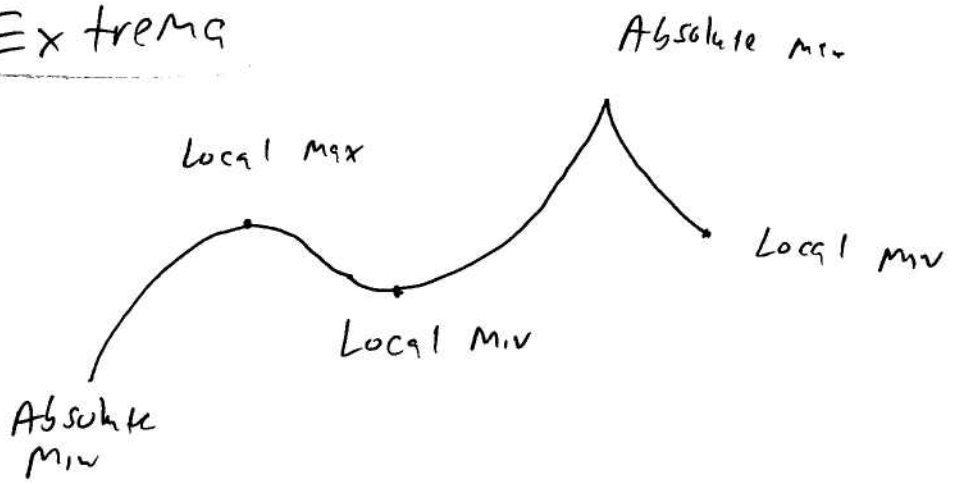
Calculus BC Section 4.1 Pg 1 of
Extreme Values of Functions

H.W. 4.1 5-10, 11-29 odd, 45-50

→ **Absolute Extreme Values**
Let f be a function with domain D.
absolute max at $f(c)$ iff $f(x) \leq f(c)$ for
absolute min at $f(c)$ iff $f(x) \geq f(c)$ for all

Ex Find all absolute extrema for $y = x^2$ on $D = (-2,$

Local Extrema



Extreme Value Theorem

If f is continuous on $[a, b]$, then f has a local max and a local min on the interval.

Critical Point

A point on the domain of f at which $f' = 0$ or f' does not exist.

Extreme values occur only at critical points and End points

Ex.

Find the absolute max and absolute min of $f(x) = \frac{1}{\sqrt{9-x^2}}$

$f(x) = (9-x^2)^{-1/2}$

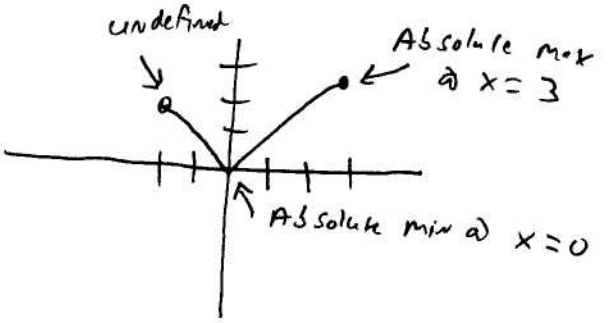
$f'(x) = -\frac{1}{2}(9-x^2)^{-3/2}(-2x) = \frac{x}{(9-x^2)^{3/2}}$

$f'(0) = 0$, $f'(\pm 3)$ is undefined b/c not defined

L

Find the extreme values of $f(x) = x^{4/5}$ on $-2 < x \leq 3$

Graphically



Analytically

$$f'(x) = \frac{4}{5}x^{-1/5} = \frac{4}{5x^{1/5}}$$

$f'(0)$ is undefined

Critical value at $x = 0$

Extreme Values potentially at $f'(0) = 0$ $x = 0$ and Endpoint $x = 3$

Absolute Min of 0 at $x = 0$

Absolute Max of 2.408 at $x = 3$