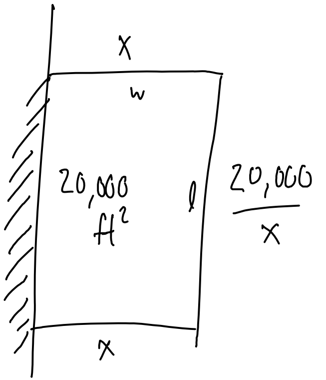
4.3, 4.4

Tuesday, June 30, 2009
7:15 AM

#74 | §4.3



$A = l \cdot w = 20,000$

$l \cdot x = 20,000$

$l = \frac{20000}{x}$

$x > 0$

$$\boxed{L(x) = 2x + \frac{20,000}{x}} = \frac{2x^2 + 20000}{x}$$

① Analyze L, domain is x>0, no y-intercept (no L(0))

x-int. $2x + \frac{20,000}{x} = 0$

$\frac{2x^2}{x} + \frac{20,000}{x} = 0 \rightarrow \frac{2x^2+20000}{x} = 0$

↳ $2x^2 + 20000 = 0$

$x^2 = -10,000$

no solutions

no x intercepts

VA at $x=0$

HA — none $\lim_{x\to\infty} 2x + \overset{0}{\cancel{\frac{20000}{x}}} = \infty$

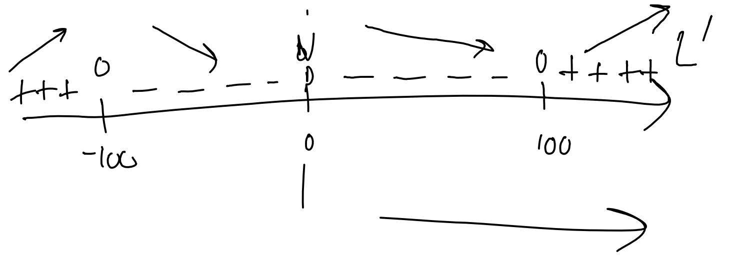
oblique asymptote $\boxed{y = 2x}$

② Analyze f'

$L(x) = 2x + 20000x^{-1}$

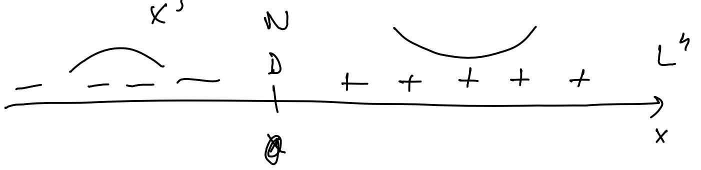
$$L'(x) = 2 - 20000x^{-2} = \frac{x^2}{x^2}2 - \frac{20000}{x^2} = \frac{2x^2 - 20000}{x^2}$$

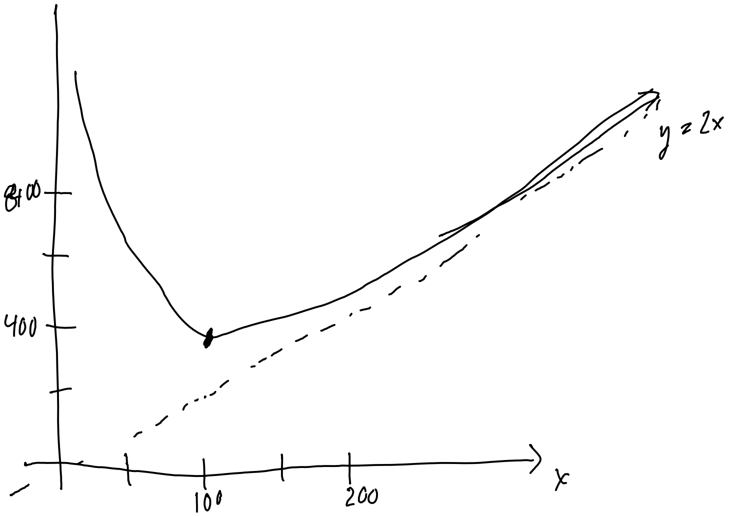
$$= \frac{2(x^2 - 10000)}{x^2} = \frac{2(x-100)(x+100)}{x^2}$$



local min at $x = 100$

③ $L''(x) = +40{,}000\,x^{-3} = \frac{40000}{x^3}$ $\qquad$ $y = L(100) = 400$





what dimensions should the storage yard be to use the least fence ?

to minimize the total length, the side parallel to the building is 200 ft

& sides extending from building are 100 ft each

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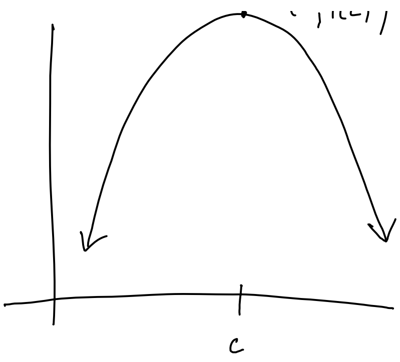
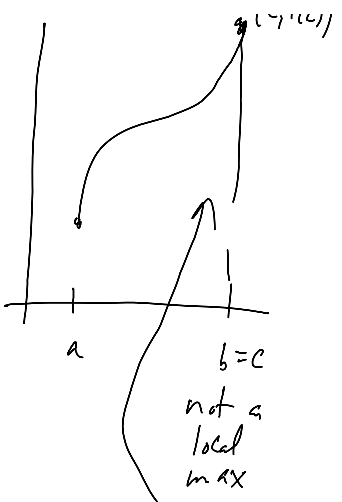
§4.4 Absolute Extrema

f has an absolute max at x = c if

$f(c) \geq f(x)$ for ALL x

(c f(c)) $\qquad$ (c f(c))

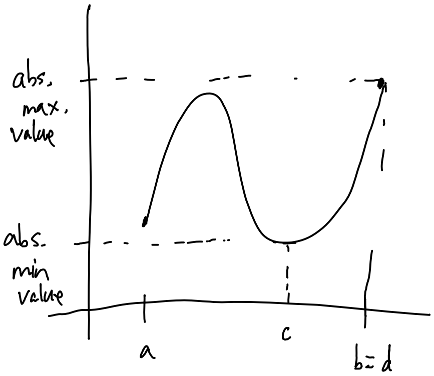


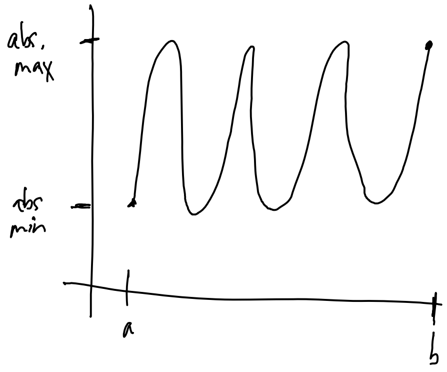


absolute min — bottom point.

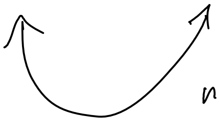
abs extrema can be local extrema but don't have to be (not a peak)

Extreme Value Theorem If f is continuous on [a,b] then ~~f has an abs. max and an abs. min~~ & there #'s c,d in the interval where f takes on the abs. max/min values.





pg. 281 / 18) $f(x) = x^4 - 4x^3$ → basic shape

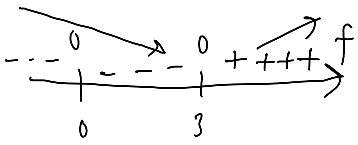


no abs max.

but there is an abs. min.

Use $f'(x)$ (+ sign chart) because abs. min. occurs at a local min.

$f'(x) = 4x^3 - 12x^2 = 4x^2[x-3]$



abs. min occurs at ~~x=0~~ $x=3$

abs. min value is $f(3) = 3^4 - 4(3)^3 = 81 - 4(27) = -27$.

pg 282 / 42/B | $f(x) = 2x^3 - 3x^2 - 12x + 24$ on $[-2,3]$

① find critical values

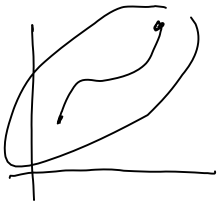
② check f at critical values &, at end points.

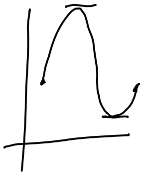
③ max/min will be in the list.

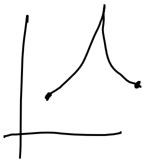
abs ~~ex~~ extrema

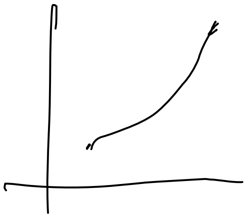
(for continuous on $[a,b]$)

Can only occur at endpoints OR at critical values









① $f'(x) = 6x^2 - 6x - 12$

$= 6(x^2 - x - 2)$

$= 6(x-2)(x+1)$

crit. values are $x=2$, $x=-1$

②

crit. values: -1, 2

x	$f(x) = 2x^3 - 3x^2 - 12x + 24$	
-2	20	
-1	31	absolute max
2	4	absolute min.
3	15	

HW → 4.4