Find absolute extrema

b) $g(x) = \ln(x+1)$ over $[0, 3]$

$g'(x) = \dfrac{1}{x+1}$

outside of domain ← + [+] → $f'(x)$

−1 0 3

one C.P at $x = -1$

abs max $= \ln 4$ at $x = 3$

abs min $= \ln 1 = 0$ at $x = 0$

c) $f(x) = x^{\frac{2}{5}}$ over $[-3, 1]$

$f'(x) = \frac{2}{5} x^{-\frac{3}{5}} \rightarrow \dfrac{2}{5\sqrt[5]{x^3}}$

only 1 critical pt ⇒ $x = 0$

x	$f(x)$
-3	$\sqrt[5]{9}$
0	0
1	1

abs min $= 0$ at $x = 0$

abs max $= \sqrt[5]{9}$ at $x = -3$

5. Each of the following statements is not always true. Explain/Show why each statement could be false.

a) If $f'(5) = 0$, then there is a maximum or minimum at $x = 5$.

↳ $f'(5) = 0$ but the graph does not have a min/max

b) If $x = 2$ is a critical point, then $f'(2) = 0$.

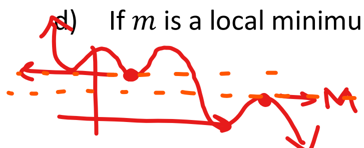
$f'(2)$ could be undefined

c) An extrema occurs at every critical point

Look at picture for "a"

d) If m is a local minimum and M is a local maximum of a continuous function, then $m < M$.

m



M but $m > M$

6. If f is a continuous, decreasing function on $[0, 10]$ with a critical point at $(4, 2)$ which of the following statements must be false?

closed

A) $f(10)$ is an absolute minimum of f on $[0, 10]$.

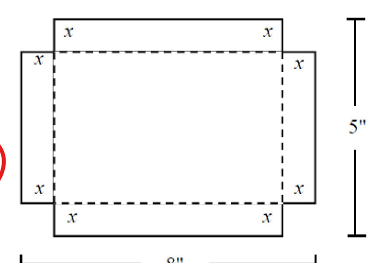
B) $f(4)$ is neither a relative maximum nor a relative minimum

C) $f'(4)$ does not exist

D) $f'(4) = 0$

E) $f'(4) < 0$ can't happen because there is a C.P at $x = 4$

7. An open top box is to be made by cutting congruent squares of side length x from the corners of a 5-by-8 inch sheet of tin and bending up the sides (see figure shown below). How large should the squares be to maximize the volume of the box?



$L = 5 - 2x \quad W = 8 - 2x \quad H = x$

$V = (5-2x)(8-2x)(x)$

$V = (40 - 10x - 16x + 4x^2)(x)$

$V = (40x - 10x^2 - 16x^2 + 4x^3)$

$V = 40x - 26x^2 + 4x^3$

$\frac{dV}{dx} = 40 - 52x + 12x^2$

$0 = 4(3x^2 - 13x + 10)$

$0 = 4(3x - 10)(x - 1)$

$x = \frac{10}{3} \quad x = 1$

← + | − | + →

1 10/3

max occurs at $x = 1$ since $V'(x)$ + to −

Squares should be 1x1