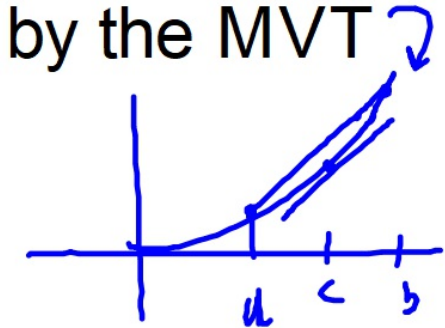
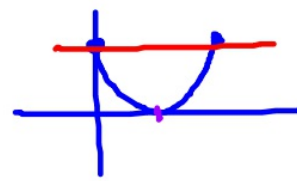


Good afternoon warm up

Find the value(s) of c guaranteed to exist by the MVT for $f(x)=x^3-2x^2+2$ on $[0,2]$

- ① check if MVT applies polynomial \rightarrow yes.
- ② find avg rate
- ③ find instant rate ($f'(x)$)
- ④ set =, solve.



②
$$\frac{f(b) - f(a)}{b - a} = \frac{2 - 2}{2 - 0} = \frac{0}{2} = 0$$

Slope of

Secant line

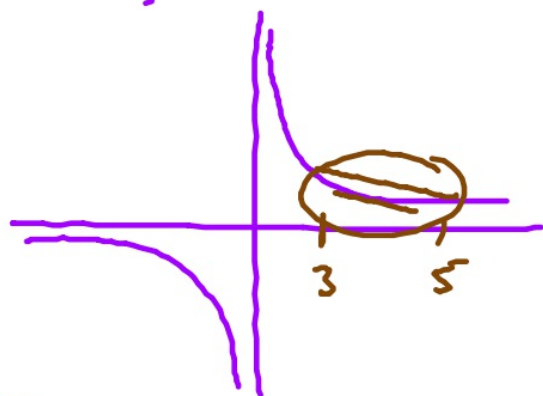
③ $f'(x) = 3x^2 - 4x$

④ $3x^2 - 4x = 0$

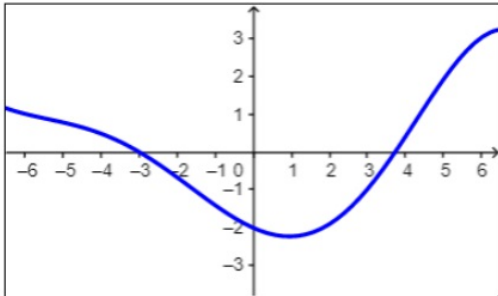
$x(3x - 4) = 0 \Rightarrow x = 0, \frac{4}{3}$

Not in $(0, 2)$

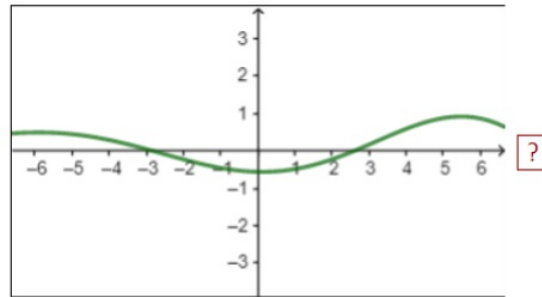
$$f(x) = \frac{1}{x}$$



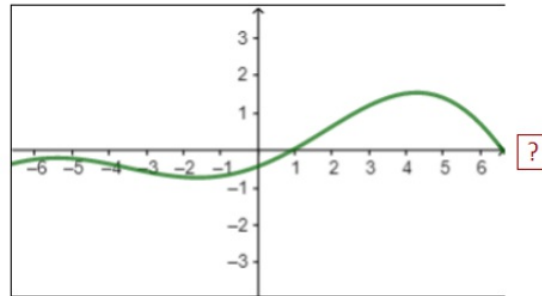
Identify the Derivative Function



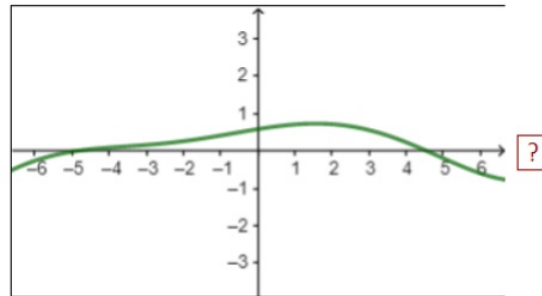
Reset Graphs



1 finger (not that one)

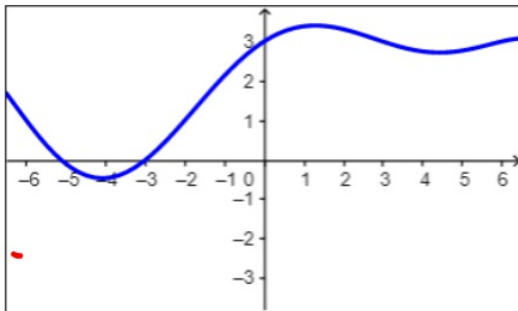


2 fingers ✓

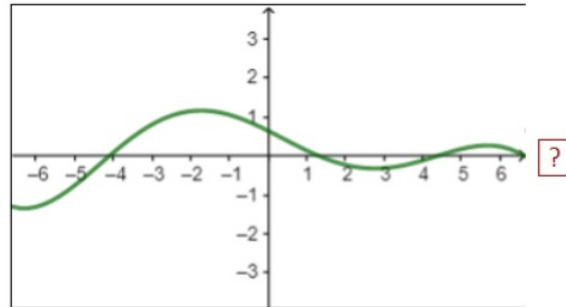


3 fingers

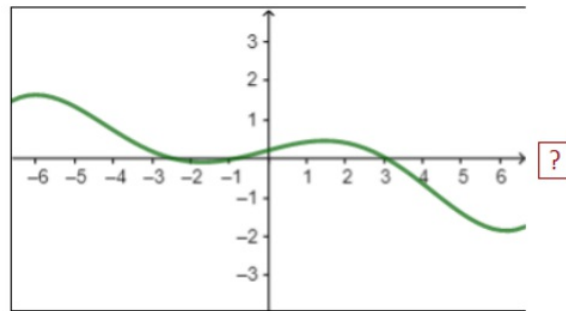
Identify the Derivative Function



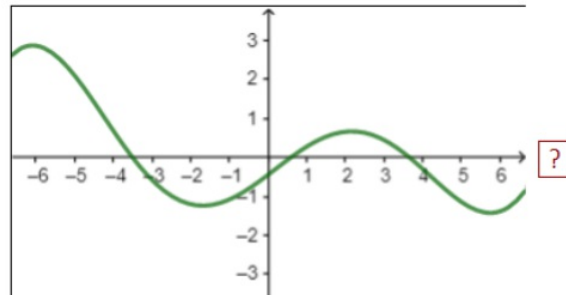
Reset Graphs



1 finger ✓

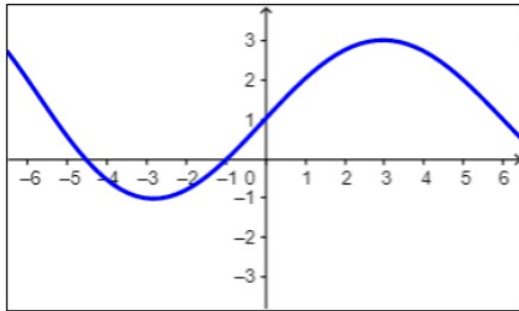


2 fingers

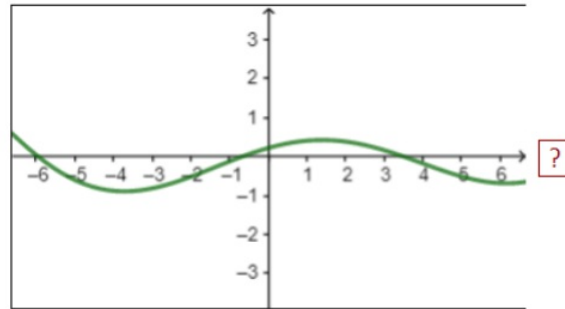


3 fingers

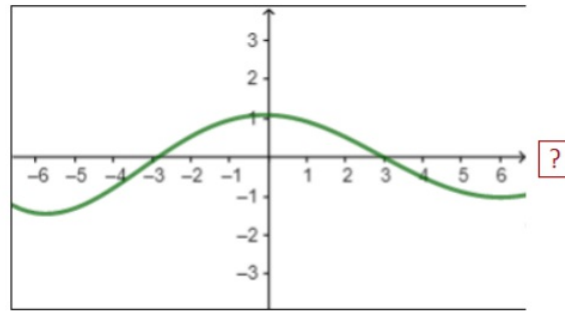
Identify the Derivative Function



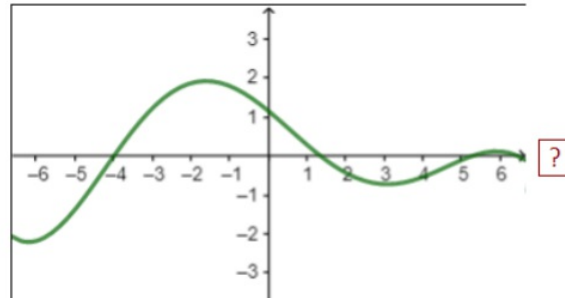
Reset Graphs



1 finger



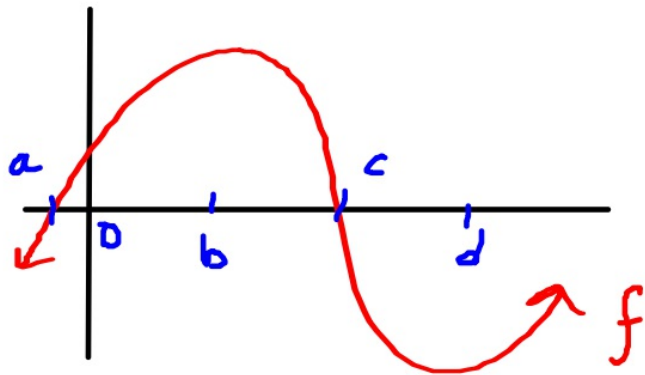
2 fingers



3 fingers

Intervals of Increase and Decrease

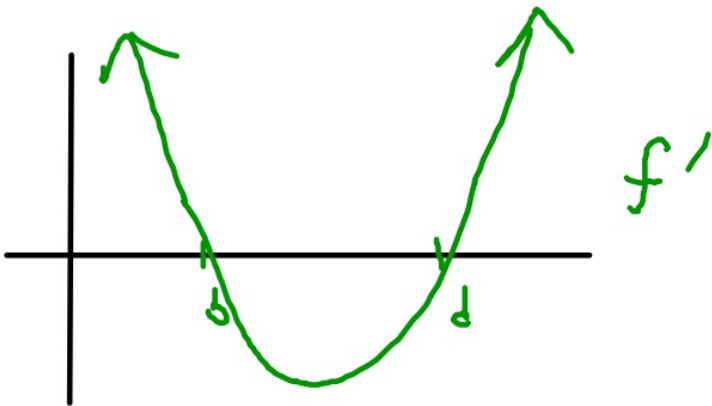
Notes



f is increasing
from $(-\infty, b) \cup (d, \infty)$
b/c $f' > 0$

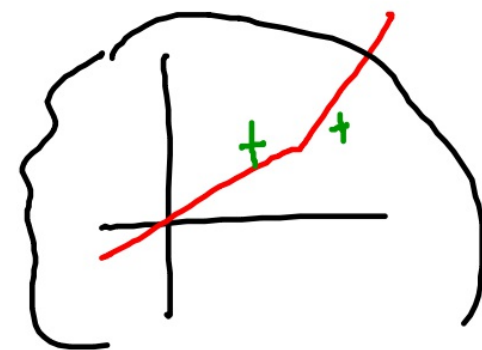
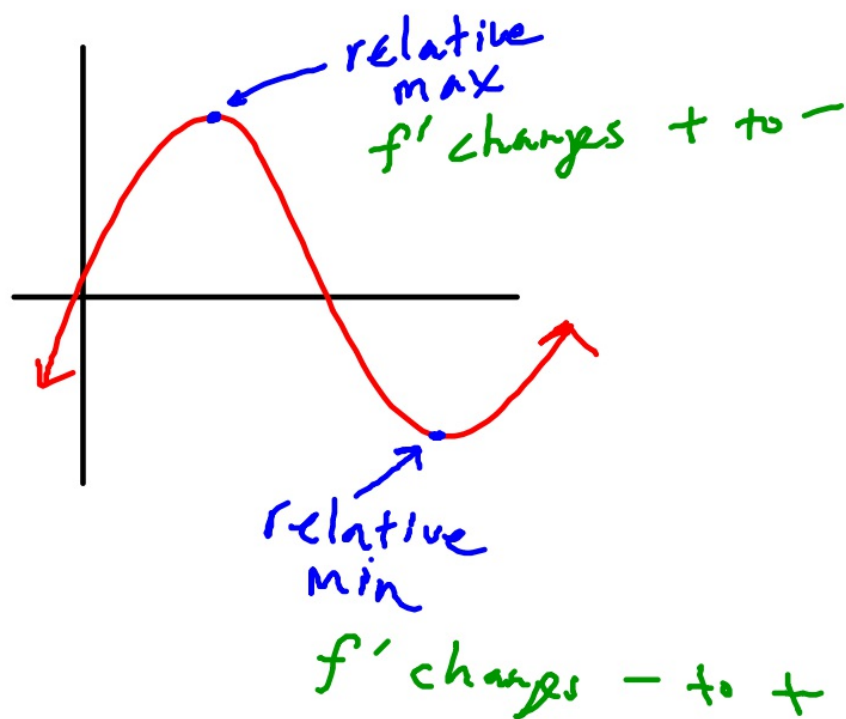
f is decreasing from
 (b, d)

b/c $f' < 0$



Relative (Local) Extrema

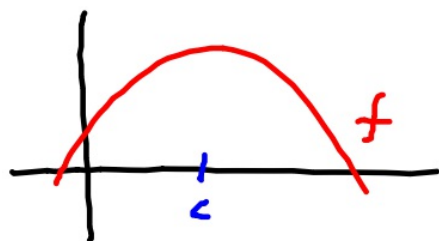
What does it mean to be a local maximum?



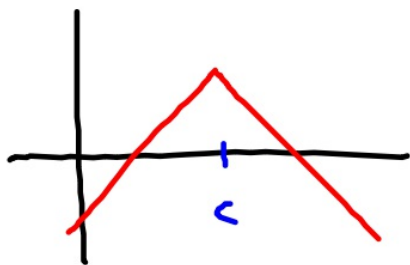
A continuous function f has a local maximum at $x=c$ if f' changes sign from positive to negative at c

A continuous function f has a local minimum at $x=c$ if f' changes sign from negative to positive at c

To go from positive to negative at $x=c$
what could be true of $f'(c)$?



$$\underline{f'(c) = 0}$$



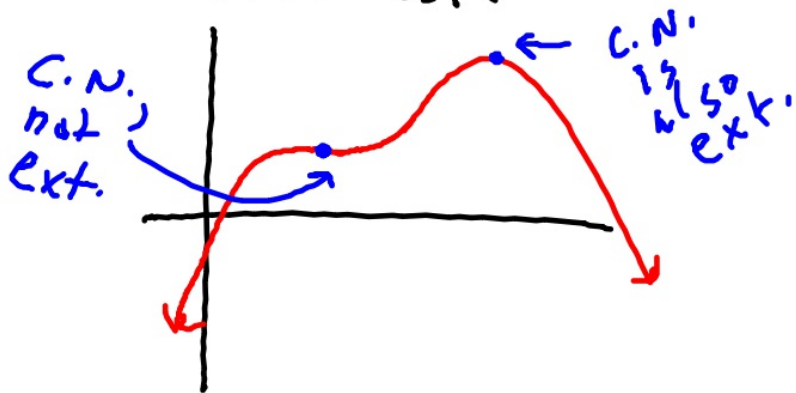
$$\underline{\underline{f'(c) \text{ undefined}}}$$

Definition:

A number c , in the domain of f , is a critical number of f iff $f'(c) = 0$ or $f'(c)$ is undefined

**all relative extrema occur at critical numbers

BUT *not all c.n. are rel. extrema.*

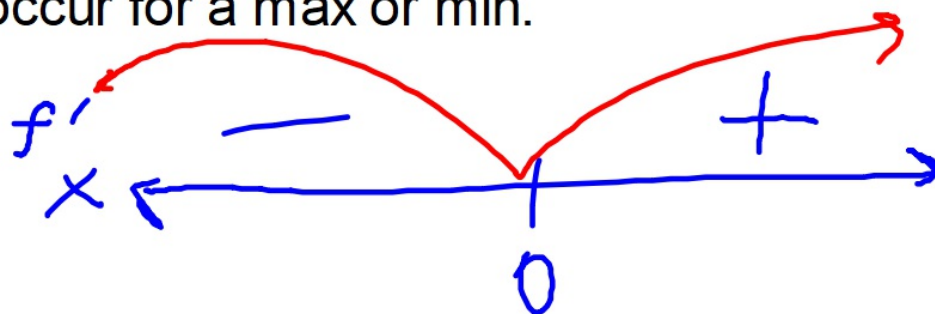


How to find where a function has relative extrema

1. Take the derivative of y , y'
2. Find C.N.
 - ↳ Set y' equal to zero, solve; consider where it is undefined.
3. Plot C.N. on number line, do bunnyhops for signage
4. A sign change must occur for a max or min.

$$f(x) = 3x^2$$

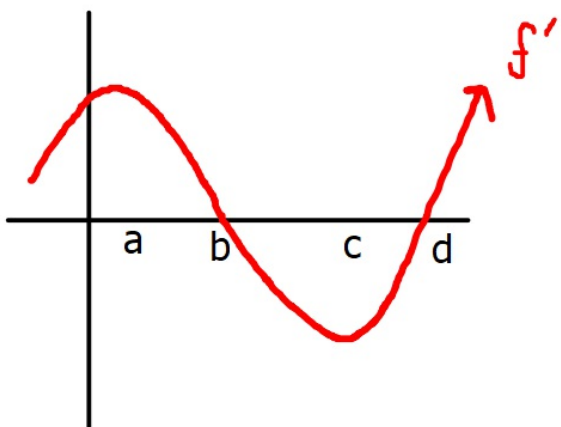
$$f'(x) = 6x = 0$$
$$\frac{x=0}{\text{C.N.}}$$



f has a rel min @ $x=0$

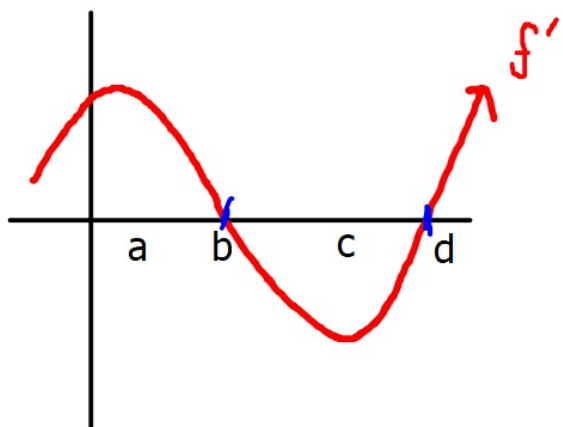
b/c f' changes from $-$ to $+$.

Where does F have a relative maximum?



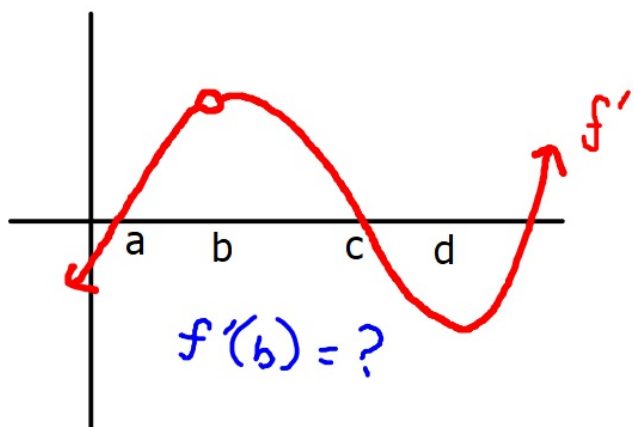
- A a only
- B b only
- C c only
- D d only
- E a and c
- F a and b

Where does F have critical numbers?



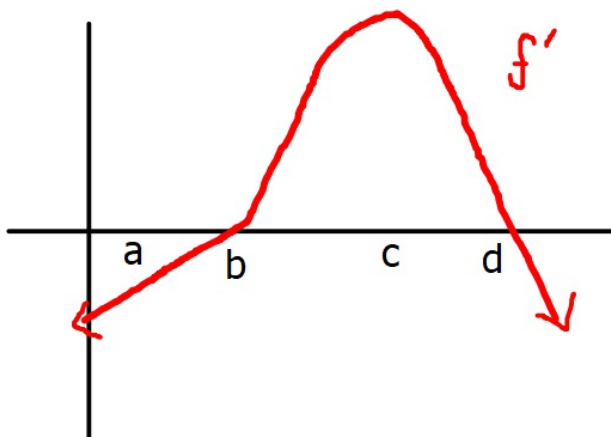
- A a only
- B b only
- C c only
- D d only
- E a and c
- F b and d

Where does F have a critical number but NOT a relative extrema?



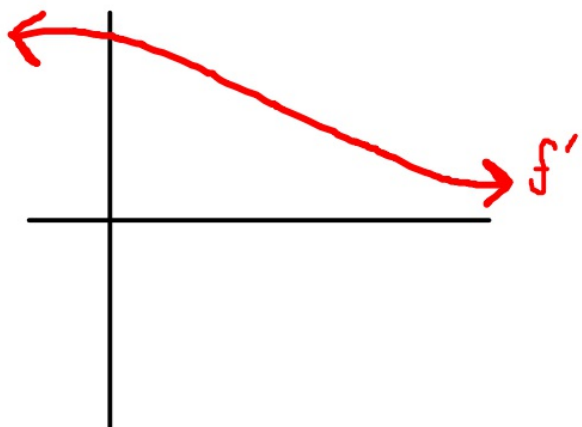
- A a only
- B b only
- C c only
- D d only

Where does F have a relative minimum?



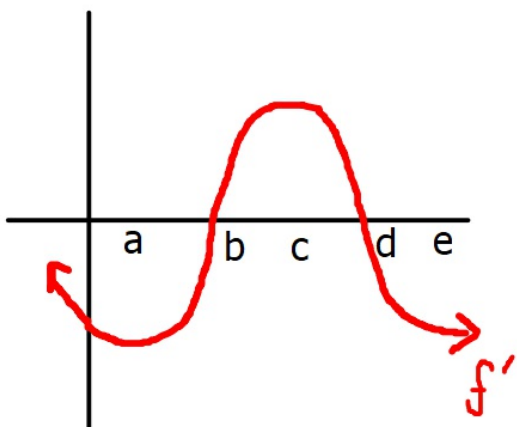
- A a only
- B b only
- C c only
- D d only
- E a and c
- F a and b

Which is true about F?



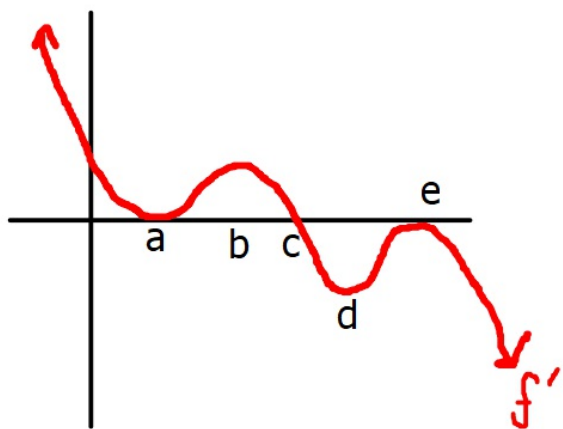
- A always increasing
- B always decreasing
- C increases, then decreases
- D decreases, then increases

Where does F have a relative maximum?



- A a only
- B b only
- C c only
- D d only
- E e only
- F both a and d

Where does F have a relative minimum?



A a only

B b only

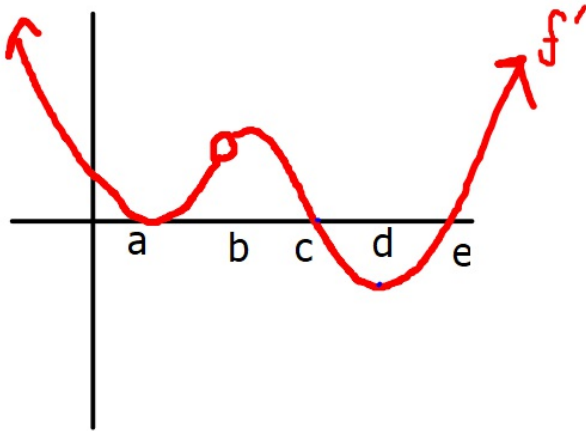
C c only

D d only

E e only

F none of these

Which is NOT a critical number of F ?



- A a only
- B b only
- C c only
- D d only
- E e only

HW

due Friday:

(MUT) p. 174 # 31-40

due Monday:

p. 183 #18-39 (mult of 3)

find and classify local extrema + intervals of increase/decrease

EXTRA