Good afternoon and welcome back

Assessments are being passed back

We'll be using peer experts on 2 problems:

#9: Zack

#11: Grayson

9. Find the values of a and b that would make f(x) differentiable. $f(x) = \begin{cases} ax^2 + bx - 3 & x < 1 \\ -x^2 + 3x + 6 & x \geq 1 \end{cases}$

f cont

$1a + 1b - 3 = -1 + 3 + 6$

$+3$

$a + b = 11$

f'

$f'(x) = \begin{cases} 2ax + b \\ -2x + 3 \end{cases}$

$2a + b = -2 + 3$

$2a + b = 1$

$\begin{cases} a + b = 11 \\ 2a + b = 1 \end{cases}$ ✓

$-$

$-a = 10$

$\frac{-a}{-1} = \frac{10}{-1}$

$a = -10$

$2(-10) + b = 1$

$-20 + b = 1$

$b = 21$

$\frac{d}{dx}(xy^2 - 3x + 2x^2) = (4)\frac{d}{dx}$

f g

$f: x \quad g: y^2$

$f': 1 \quad g': 2yy'$ (*)

$1 \cdot y^2 + x \cdot 2y \cdot y' - 3 + 4x = 0$

$y^2 + 2xy(y') - 3 + 4x = 0$

$2xyy' = 3 - 4x - y^2$

$y' = \frac{3 - 4x - y^2}{2xy}$

$y' = \frac{3 - 4x - y^2}{2xy} \rightarrow$ 3/2

x y

(2, -1)

11. Find the x-values of any horizontal and vertical tangents to $f(x) = (x^2 - 1)^{\frac{1}{3}}$

$\frac{1}{x^n} \rightleftharpoons x^{-n}$

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

$$\frac{1}{3(x^2-1)^{\frac{2}{3}}} \cdot 2x = \frac{2x}{3(x^2-1)^{\frac{2}{3}}}$$

Vertical

$x = 1$ or -1

H.T.

$2x = 0$

$x = 0$

Horizontal = .

V.T.

$x = 0$

$3(x^2-1)^{2/3} = 0$

$x^2 - 1 = 0$

$x^2 = 1$

$x = \pm 1$

Need to reassess? Be sure to have hw's finished

Need to assess first time?

- Tutoring tomorrow 4-5p
- DS Thursday+Friday

Mean Value Theorem

If $f(x)$ is continuous on [a,b] and differentiable on (a,b), then there exists some c in (a,b) such that

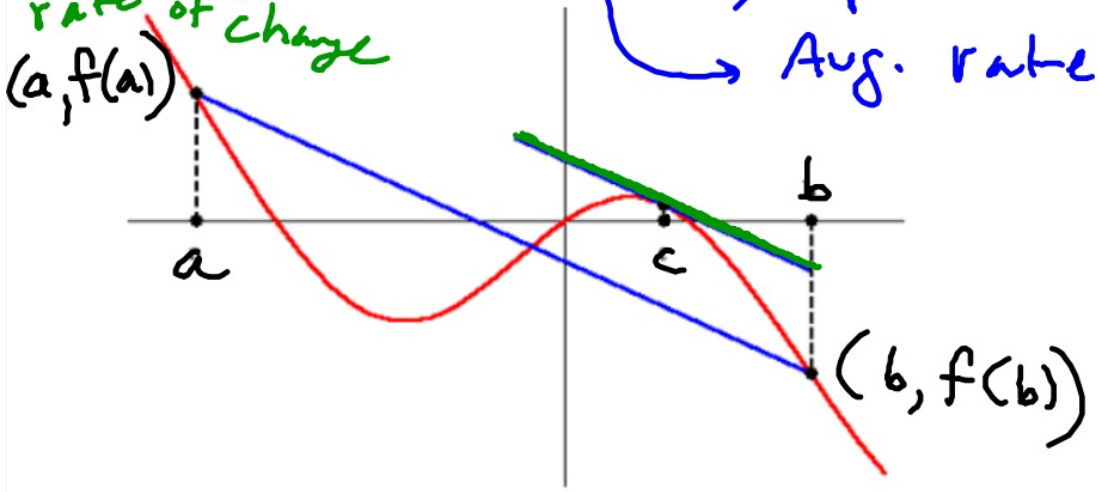
$$f'(c) = \frac{f(b) - f(a)}{b - a}$$

slope of tan line

instant rate of change

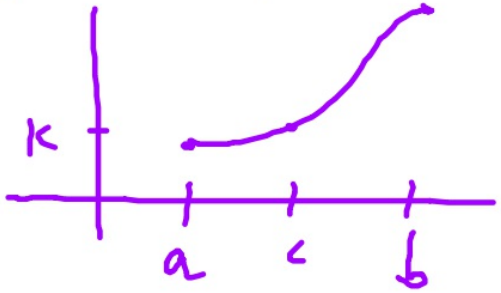
slope of secant line

Avg. rate of change



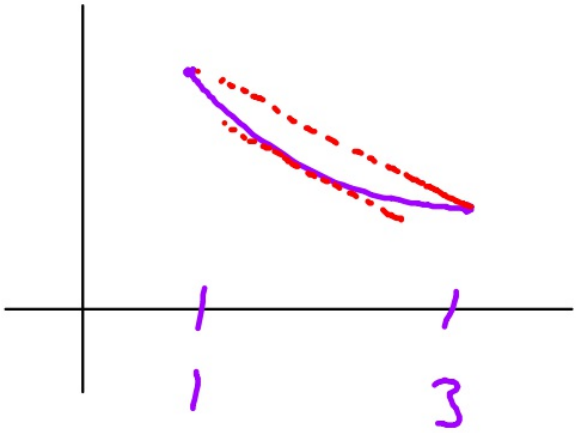
Attach to your notes

Continuity is a requirement for the IVT to apply

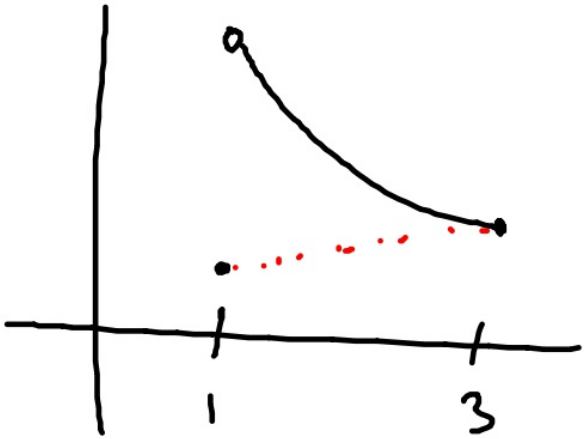


Differentiability is a requirement for the MVT to apply

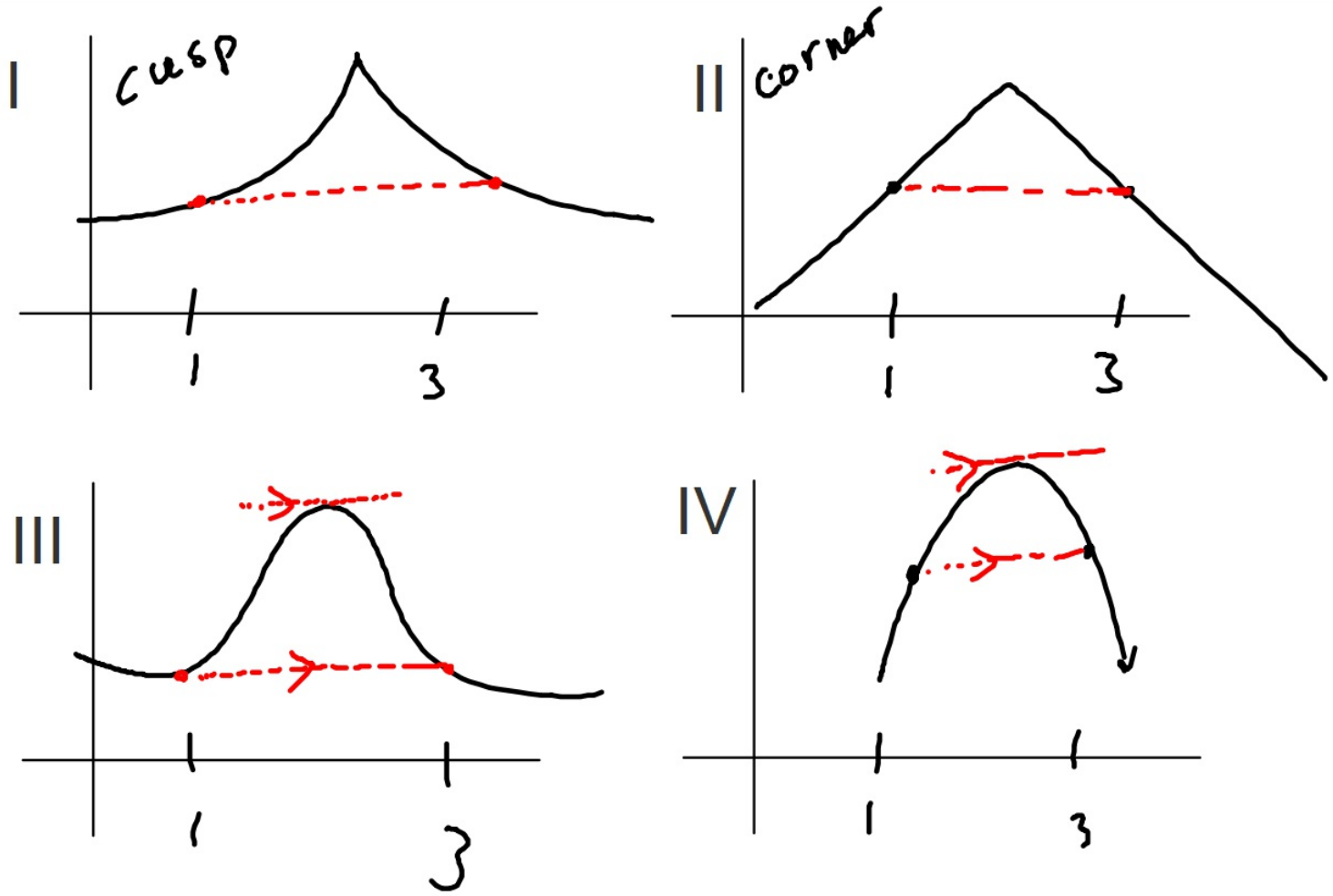
Why is differentiability needed? Why is continuity not enough



continuous,
mvt seems to work



not continuous,
mvt obviously fails



All 4 are continuous, but only III and IV are differentiable

see how MVT fails for I and II?

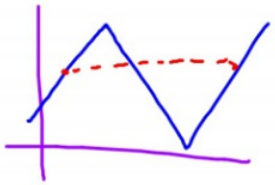
Have we seen this before??

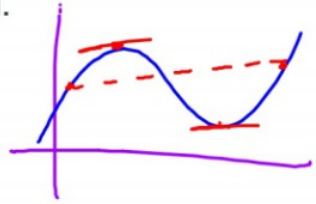
2nd warm up :)

Your car enters a toll highway at 1pm. The highway stretches for 120 miles and has a speed limit of 55mph. You come to the toll booth at the end of the highway at 3pm and are handed a speeding ticket.

Why? Explain your reasoning.

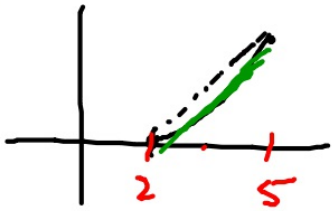
Mean Value Theorem





August 14, 2017

Find the value(s) of c guaranteed to exist by the MVT for $f(x)=x^2-6x+8$ on $[2,5]$
(a b)



① Is it diff?
yes, b/c polynomial, so MVT applies.

② Find the avg. rate of change

$$\frac{f(b)-f(a)}{b-a} = \frac{f(5)-f(2)}{5-2} = \frac{3-0}{3} = 1$$

③ Take derivative

$$f'(x) = 2x-6$$

④ Set $f'(x)$ = avg. rate

$$2x-6=1$$

$$2x=7 \Rightarrow x=3.5$$

↑ is this between $[2,5]$? yes.

HW

p. 174 #31-40

due Friday 12/1