Calculus

Study of Change (of Functions)

Rates of Change ① Average = Slope between Two Points

② Instantaneous → Slope of Tangent line at ONE Point.

Derivative dy/dx

$f'(x)$

Derivate at a Point	Derivate as a Function
$f'(a)$	$f'(x)$
$dy/dx \Big\vert_{x=a}$	dy/dx
nderiv(Y_1, X, a)	nderiv(Y_1, X, X)

$f(x) = \frac{1}{3}x^2 + \frac{5}{3}x + 1$

$f'(x) = \frac{2}{3}x^1 + \frac{5}{3}$

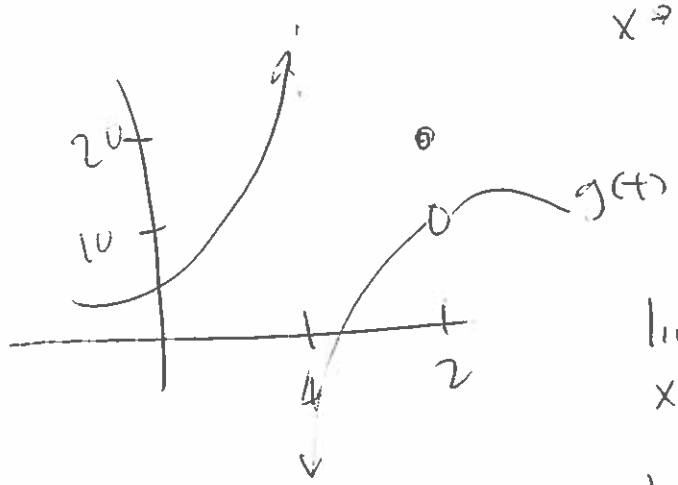
Limits

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Slope of TWO POINTS $\longrightarrow$ Slope at ONE POINT

① From Graph

$$\lim_{x \to 2} g(x) = 10$$



$$\lim_{x \to 1^-} g(x) = \infty$$

$$\lim_{x \to 1} g(x) = \text{DNE}$$

UNDEF

② From Equations

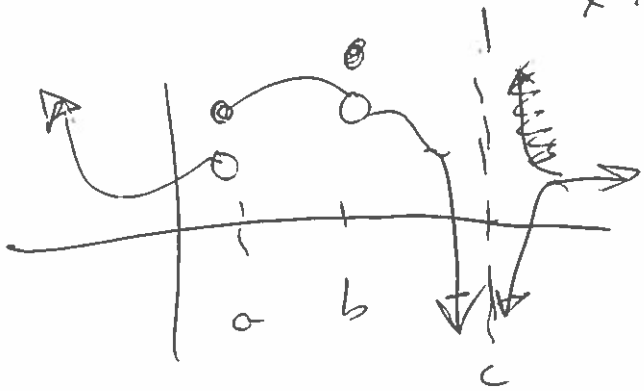
$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$$

Ⓐ Plug in $\frac{4-4}{2-2} = \frac{0}{0}$

$$\lim_{x \to 2} \frac{(x+2)\cancel{(x-2)}}{\cancel{(x-2)}} = 4$$

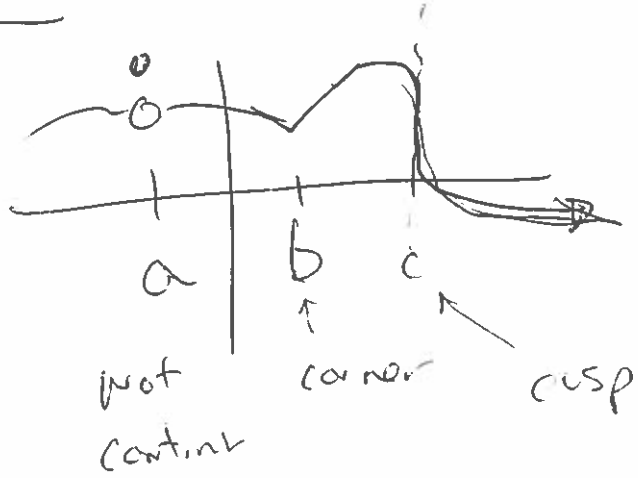
Continuity

1. lim. Exists at a
2. f(x) Exists at a
3. $\lim_{x \to a} f(x) = f(a)$



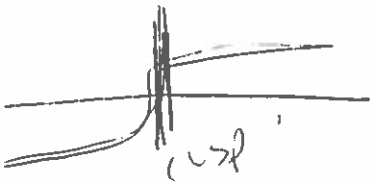
← Not cont at a, b, c

Differentiability



Rules for Differentiating

$y = \sqrt[3]{x} = x^{1/3}$



Power rule

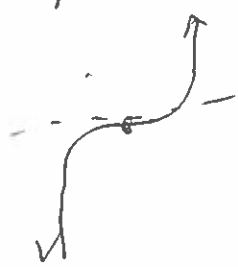
$y' = \frac{1}{3} x^{-2/3} = \frac{1}{3x^{2/3}}$ ← function not defined at $x = 0$

If Derivative at at point >0

$f'(a) > 0$ $f(x)$ at a is increasing

$f'(b) < 0$ $f(x)$ at b is decreasing

$f'(c) = 0$ $f(x)$ is constant or MAX/MIN/?



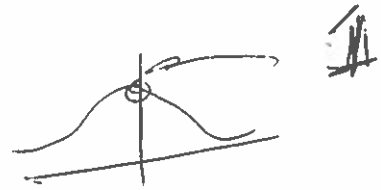
$$\frac{d}{dx} e^x = e^x$$

$$\frac{d}{dx} a^x = a^x \ln a$$

$$\frac{d}{dx} \ln x = \frac{1}{x}$$

$$\frac{d}{dx} \log_b x = \frac{1}{x \ln b}$$

$$\lim_{h \to 0} \frac{\sin h}{h} = \frac{0}{0}$$ From Graph



$$= 1$$

$f(x) = \sin x$

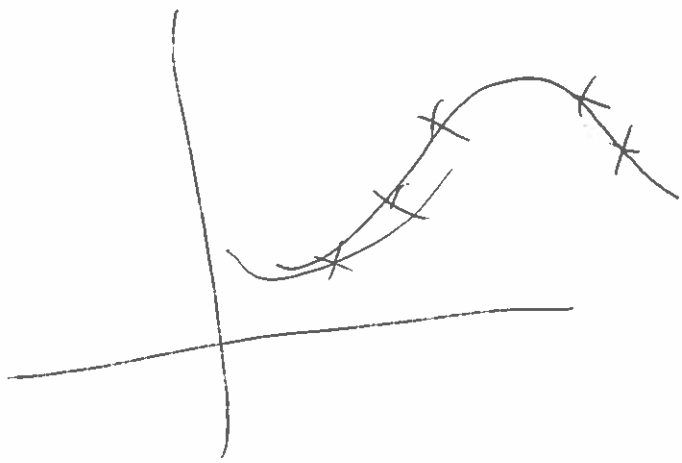
$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$\lim_{h \to 0} \frac{\sin(x+h) - \sin x}{h}$$

$$\lim_{h \to 0} \frac{\sin x \cos h + \cos x \sin h - \sin x}{h}$$

$$\lim_{h \to 0} \frac{\sin x(\cos(h) - 1)}{h} + \cos x \left(\frac{\sin x}{h}\right)$$

Getting sinreg to work



$y = \text{sinreg} = A\sin(Bx + C) + D$

$y' = \qquad = A\cos(Bx + C) \cdot \frac{d}{dx}(Bx)$

$= A\cos(Bx + C) \cdot B$

= nderiv(Y1, X, X)

X	
1	5
2	4
3	-4
4	-5
5	2
6	6

← In 2001 Lady Gaga Career is growing at $5 million dollars per year. with sin Reg.

GROUP NAME: Fish math Bombs	Student Names (First and Last)
Logo:	Speaker/Presenter: Bobby O'Connor
Date: 4/20	Writer/Prep: Bill Smith
Topics:	QC/Leader: [redacted]

Instructions:

year	Price of PBR
3	13
5	15
7	17
9	19
11	20
13	21
15	18

$y = 3.82.. \times \sin(.319 \cdot y + -2.139..) + 16.655$

↑ data

In the year 1980 PBR cost $13.57

in 2017 PBR will cost $16.10

X	Y	Y2
4	17.214	.97585
11	22.401	2.0445
13	20.12	-.5197
15	18.46	-1.015
17	16.098	-1.207

In 2013 the price of PBR is decreasing by .5197

In 2017 the price of PBR is decreasing by $1.207

GROUP NAME:	**Student Names (First and Last)**
Logo:	**Speaker/Presenter:**
Date:	**Writer/Prep:** Jared
Topics:	**QC/Leader:**

Instructions:

L_1	L_2
9	14 kb/
9	[illegible] kb/
1	56 kb/
1	5[illegible] kb/
1	[illegible] kb/
1	[illegible] kb/
1	[illegible] kb/

$y = 536[illegible] \cdot [illegible] + [illegible] \cdot [illegible]x + [illegible]81615$
$6[illegible]37) + 3943.545[illegible]$

x	y_1	y_2 (Derivative)
1	2[illegible] kb	-467
1	-[illegible] kb/s	-1[illegible]
1	36[illegible] kb/s	1,768.5
1	5,[illegible] kb	19,553
1	[illegible] kb/s	384[illegible]
1	7[illegible] kb/s	-,63[illegible]
1	-16[illegible] kb/s	-12[illegible]

GROUP NAME: Logo:	Student Names (First and Last) Speaker/Presenter: _____
Date:_____ Topics:	Writer/Prep:_____ QC/Leader:_____
Instructions:	

PROF. PORTER MATH CLASSWORK

GROUP NAME: Time Is Money Logo: 	Student Names (First and Last) Speaker/Presenter: Angelika Mazurek Writer/Prep: Shuiam Singh (Shiv) QC/Leader: Eugenio Pelaez
Date:_____ Topics:	
Instructions:	

GROUP NAME: Logo:	Student Names (First and Last) Speaker/Presenter: _____
Date:_____ Topics:	Writer/Prep:_____ QC/Leader:_____

Instructions:

GROUP NAME: Logo:	Student Names (First and Last) Speaker/Presenter: _____
Date:_____ Topics:	Writer/Prep:_____ QC/Leader:_____

Instructions: