Definition of Derivative

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

$$\lim_{h \to 0} \frac{f(3+h) - f(3)}{h} = f'(3)$$

Ex

$$\lim_{h \to 0} \frac{h(2x + 4h - 7)}{h} \qquad h \neq 0$$

$$\lim_{h \to 0} 2x + 4h - 7 \to = 2x - 7$$

Find EQ of Tan Line at $x = 2$

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

$$\lim_{h \to 0} \frac{\frac{1}{x+h+3} - \frac{1}{x+3}}{h}$$

$$\frac{\frac{1}{x+h+3} - \frac{1}{x+3}}{h}$$

$$= \frac{(x+3) - (x+h+3)}{(x+h+3)(x+3)} \cdot \frac{1}{h}$$

$$= \frac{-h}{(x+h+3)(x+3)h}$$

$$f'(x) = \lim_{h \to 0} -\frac{1}{(x+h+3)(x+3)} = -\frac{1}{(x+3)^2}$$

($h \to 0$)

$$f'(2) = -\frac{1}{(2+3)^2} = -\frac{1}{25} = \text{slope of Tangent Line}$$

POINT $x = 2$ $y = \frac{1}{2+3} = \frac{1}{5}$

$(2, 1/5)$

$m = -\frac{1}{25}$

$$y = m(x - h) + k$$

$$y = -\frac{1}{25}(x-2) + \frac{1}{5}$$

$$y - y_0 = m(x - x_0)$$

$$y = m(x - x_0) + y_0$$

Derivatives

$$\frac{d}{dx} a = 0$$

$$\frac{d}{dx}\left(f(x)+g(x)\right) = \frac{d}{dx} f(x) + \frac{d}{dx} g(x)$$

$$= f' + g'$$

$$\frac{d}{dx} a f(x) = a \cdot \frac{d}{dx} f(x)$$

$$= a f'(x)$$

Power Rule

$$\frac{d}{dx} x^n = n \cdot x^{n-1}$$

Ex

$$y = x^3 - 5x^2 + 7x^{-2}$$

$$y' = 3x^2 - 10x^1 - 14x^{-3}$$

Ex $y = \dfrac{\sqrt{x} + 4x^2}{\sqrt[3]{x^2}}$

Algebra: $\dfrac{x^{1/2}}{x^{2/3}} + \dfrac{4x^2}{x^{2/3}}$

$x^{1/2-2/3} + 4x^{2-2/3}$

$y = x^{-1/6} + 4x^{4/3}$

$y' = -\frac{1}{6}x^{-1/6-1} + 4 \cdot \frac{4}{3}x^{4/3-1}$

$= -\frac{1}{6}x^{-7/6} + \frac{16}{3}x^{1/3}$

Exponential

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

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

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

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

Ex $\frac{d}{dx} a * b^x = a \cdot \frac{d}{dx} b^x$

$= a \cdot b^x \cdot \ln b$

Exp reg

Ex $\frac{d}{dx} a + b \ln x = b \cdot 1/x = \frac{b}{x}$

lnreg

Ex $\frac{d}{dx} a * x^b = a \cdot b \cdot x^{b-1}$

$= a \cdot x \wedge (b-1) \cdot b$

3	1.52	1.56	1.62

By my Power regression, I see that the rate of Change at game 3 is 1.62 goals per game.

GROUP NAME: Squiggles R us

Date: 2/11/14

Independant Variable (x-axis): Hours

Dependant Variable (y-axis): Liters Consumed

Student Names (First and Last)

Speaker/Presenter: Kevin I

Writer/Prep: Anik Patel

Leader/Collaborator: Kevin V

Conclusion (in words): Based on the ln reg, alcohol consumption drops by an unsteady rate in liters @ hour 2, alcohol is being consumed $@ \approx 6L/hr$

Supporting Work:

Hours	Liters of alcohol consumed
1	15
2	35
3	50
4	83
5	101

$\ln reg = Y_1 = \frac{53.866\ldots}{x}$

$exp reg = Y_2 = 11.39\ldots \times 1.60\ldots^{x(\ln(1.60))}$

$power reg = Y_3 = 14.86\ldots x^{.20} \times 1.20\ldots$

X	Y1	Y2	Y3
1	53.867	8.6623	17.425
2	26.933	13.91	20.672
3	17.956	22.336	22.471
4	13.467	35.[illegible]	23.841
5	10.773	57.5[illegible]	24.961
0	ERROR	5.3945	0

GROUP NAME: El Business

Date: 2/11/14

Student Names (First and Last)

Speaker/Presenter: Ryan Z

Writer/Prep: Brittany Bayo

Leader/Collaborator: Andy Z

Independant Variable (x-axis): World cups

Dependant Variable (y-axis): goals scored

Conclusion (in words): By our exponential regression I see that the rate of change in the 3rd world cup is increasing by 2.12 goals per game

Supporting Work:

[y=] Clear all table

y_1 [STAT][CALC] 0: exp reg

$y = a * b^x$

[vars] 5: (>)(>) [enter]

arrow to the end & [*][ln] (1.057048399358 9) our b value

[y=] y_2 [STAT][CALC] 9: lnreg

[vars] 5: (>)(>) [enter]

$y = a + b \ln x$ [delete] lnand all before b [2nd][del][÷] before x

[y=] y_3 [STAT][CALC] A: pwr

$y = a * x^b$ [vars] 5: (>)(>) [enter]

[2nd][del][X] before x arrow to b & insert [(] arrow to end

[=] 1 [)][*] .1214701126275 our b

→ [2nd][graph] 3:

X	Y_1	Y_2	Y_3
3	2.122	1.626	1.575
	expreg	lnreg	pwrreg

Want to keep fans engaged with more goals being scored in the game.

GROUP NAME: The Rust Jobs ☺

Date: 11FEB14

Student Names (First and Last)

Speaker/Presenter: Keith Mesc[illegible]ll

Writer/Prep: Greg M[illegible]

Leader/Collaborator: [illegible]

Independant Variable (x-axis): Days

Dependant Variable (y-axis): Rust!

Conclusion (in words): Shit rusts fast according to our power graph at 7 days our accumulation of rust is at 3.877%

Rust grows percent per day

Supporting Work:

days	rust
[illegible]	3
4	14
[illegible]	19
	24
[illegible]	29
	38

$Y_1 = 3.66153863 55279 \times 1.2409[illegible]^{x} \times \ln(1.24098185440)$

$Y_2 \; 17.922486375203/3$

$Y_3 : 1.5460484852833 \cdot 1.327123516703 \cdot X^{(1.327123516703[illegible])}$

X	Y_1 (exponential)	Y_2 (lines)	Y_3 (powers)
7	3.589	2.566	3.877

GROUP NAME: ILUVSHOES

Date: 2/11/14

Student Names (First and Last)

Speaker/Presenter: DOMINIQUE C.

Writer/Prep: Valeen Sinclair

Leader/Collaborator: MAGDALENA [illegible]

Independant Variable (x-axis): $1,000

Dependant Variable (y-axis): Shoes

Conclusion (in words):

Based off of ~~[illegible]~~ my power regression, I see that the rate of change ~~[illegible]~~ is about at ~~[illegible]~~ shoes per $505,000.00 is 0.165 per every thousand dollars.

Supporting Work:

~~[illegible] 131.703 [illegible]~~

1.) EXP Regression

$y1 = 131.703\ldots * 1.001^{\wedge} x * \ln(1.001)$

$A = 131.703$

$B = 1.001\ldots$

$\boxed{A * B^{\wedge} x * \ln B}$

2) Ln Regression

$y2 = 76.726\ldots / x$

~~A=~~

$B = 76.726$

$\boxed{B / x}$

3) power Regression

$y3 = 27.092\ldots x^{\wedge}(.349\ldots - 1) * .349\ldots$

$A = 27.092\ldots$

$B = .349$

$\boxed{A x^{\wedge} B - 1 * B}$

GROUP NAME: I ♡ Science

Date: 2/11/14

Student Names (First and Last)

Speaker/Presenter: Lindsy L

Writer/Prep: Corrina H

Leader/Collaborator: ______

Independant Variable (x-axis): Time (Hours)

Dependant Variable (y-axis): Drug Concentration (ppm)

Conclusion (in words): According to a power regression at 1 hour the rate of drug being metabolized is decreasing at 8.294 ppm/hr.

Supporting Work:

x	y
0.01	100
1	80
2	50
3	40
4	35

Power Regression : $53.767[illegible]\,x^{-0.154250304}$

y_2: Derivative : $53.7\ldots x^{(-0.154\ldots-1)}(-0.154\ldots)$

X	y_2
1	-8.294
2	-3.726
3	-2.334
8	-0.75[illegible]