

# Other Derivatives

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$$* \frac{d}{dx} \sin x = \cos x$$

$$* \frac{d}{dx} \cos x = -\sin x$$

$$\frac{d}{dx} \tan x = \sec^2 x$$

$$\frac{d}{dx} \sec x = \sec x \tan x$$

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Product Rule

$$\frac{d}{dx} f(x) \cdot g(x) = f \cdot g' + g \cdot f'$$

Quotient Rule

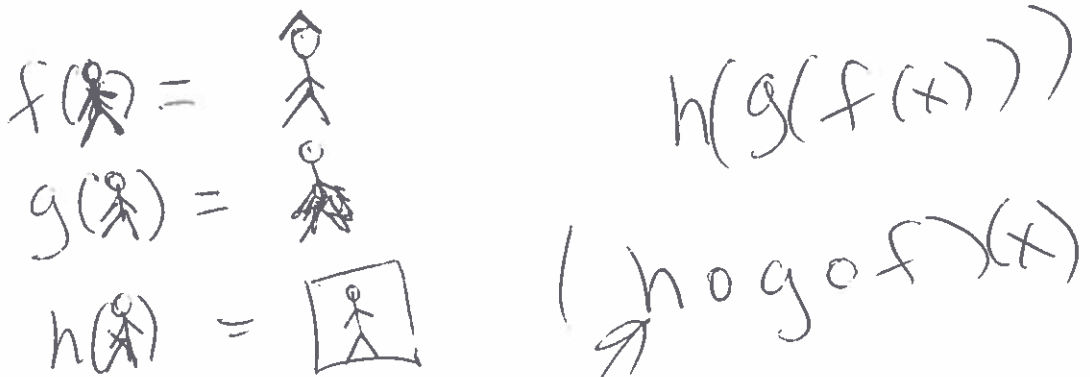
$$\frac{d}{dx} \frac{f}{g} = \frac{g \cdot f' - f \cdot g'}{g^2}$$

# Chain Rule

$$(f \circ g)(x) = f(g(x))$$

Composite Function

Assembly Line



Outer must

Outer must

EX

$$\sin^2(x) = (\sin(x))^2$$

outer  
 $x^2$

EX

$$e^{x^3} = e^{(x^3)}$$

$e^+$

$$\underline{\text{Ex}} \quad \frac{1}{\sin(e^x)} = f \circ g \circ h(x) \quad \frac{1}{x}$$

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

$$g(x) = \sin x$$

$$h(x) = e^x$$

Chain Rule

$$\frac{d}{dx}(f \circ g)(x) = f'(g(x)) \cdot g'(x)$$

$$\underline{\text{Ex}} \quad y = \sin(2x^3 + 7)$$

$$y' = \cos(2x^3 + 7) \cdot \frac{d}{dx}(2x^3 + 7)$$

$$= \cos(2x^3 + 7) \cdot 6x^2$$

or

$$6x^2 \cos(2x^3 + 7)$$

$$\underline{\text{Ex}} \frac{d}{dx} (x^2 + 1) \cdot \sin x$$

$$(x^2 + 1) \cdot \frac{d}{dx} \sin x + \sin x \cdot \frac{d}{dx} (x^2 + 1)$$

$$(x^2 + 1) \cos x + \sin x \cdot 2x$$

$$\underline{\text{Ex}} \frac{d}{dx} \frac{\sin x}{\cos x} = \frac{\cos x \cdot \frac{d}{dx} \sin x - \sin x \cdot \frac{d}{dx} \cos x}{\cos^2 x}$$

$$= \frac{\cos x \cdot \cos x - \sin x \cdot (-\sin x)}{\cos^2 x}$$

$$= \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x}$$

$$\frac{d}{dx} \tan x = \sec^2 x$$

## ~~STAT~~ Sine Regression

STAT (7) (ALL C: Sinreg) 1, L1, L2,  $\frac{10}{\text{Period}}$   
Iterate

Ex  $\frac{d}{dx} e^{x^3} = e^{x^3} \cdot \frac{d}{dx} x^3 = 3x^2 e^{x^3}$

Ex  $\frac{d}{dx} \sin^2(x) = 2 (\sin x) \cdot \frac{d}{dx} \sin x$   
Power Rule  
 $(\sin(x))^2$   
 $= 2 \sin x \cdot \cos x$

Ex  $y = a \sin(bx + c) + d$

$y_1 = \text{reg Eq.}$

$y_2 = a \cos(bx + c) \cdot \frac{d}{dx}(bx + c)$   
 $= a \cos(bx + c) \cdot b$

In 2014, by sin reg,  
Lady G's sale down  
by 85 mil/yr.

GROUP NAME: I ♥ Science

Date: 2/18/14

Student Names (First and Last)

Speaker/Presenter: Lindsay

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

Writer/Prep: Corrina

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

Leader/Collaborator: \_\_\_\_\_

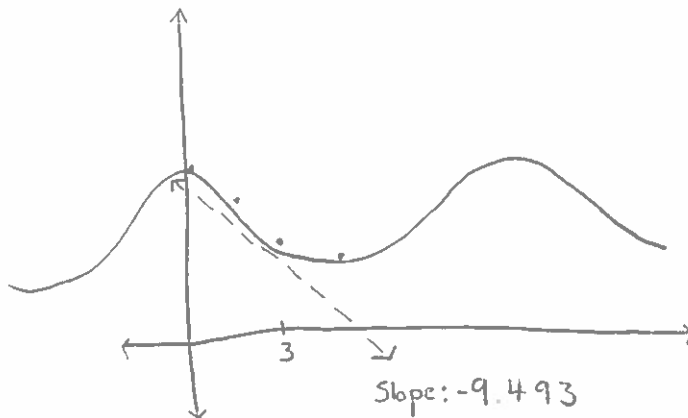
Conclusion (in words): According to the derivative of the sine regression, after three hours, the rate of drug metabolism will be decreasing by  $-9.493$  ppm/hour.

Supporting Work:

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

$$y_1: 40.337 \sin(0.628x + 2.444) + 74.875$$

$$y_2: y'_1: 40.337 \cos(0.628x + 2.444) \cdot 0.628$$



GROUP NAME: Squiggles R US

Date: 2/18/14

Student Names (First and Last)

Speaker/Presenter: Kevin I

Writer/Prep: Mishelle

Independent Variable (x-axis): Hours of Party

Leader/Collaborator: Kevin V

Dependant Variable (y-axis): liters of Alcohol consumed

Trainer: Arik P. I

Conclusion (in words):

By 6 hours by sin or regression, liters of alcohol consumed will go down by -26.57 by liters/hr

Supporting Work:

| X (hours) | Y Liters of alcohol |
|-----------|---------------------|
| 1         | 30                  |
| 2         | 35                  |
| 3         | 80                  |
| 4         | 100                 |
| 5         | 110                 |

$$Y_1 = 37.229... \cdot \cos(0.785...x + -2.001...)$$

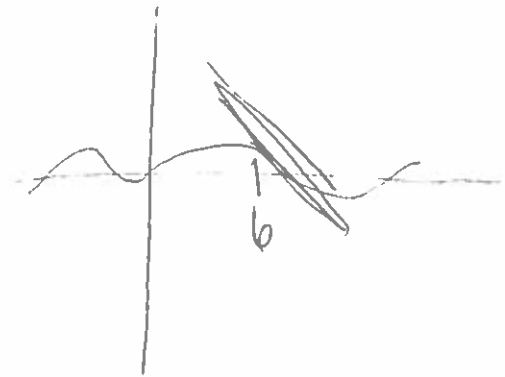
$$Y = a \sin(bx + c) + d$$

$$a = 37.229...$$

$$b = 0.7853...$$

$$c = -2.001...$$

$$d = 10.762...$$



GROUP NAME: EL BUSINESS

Student Names (First and Last)

Date: 2/18/14

Speaker/Presenter: ANDY

Independent Variable (x-axis): YEARS

Writer/Prep: RYAN

Dependant Variable (y-axis): NFL REVENUE (IN BILLIONS)

Leader/Collaborator: \_\_\_\_\_

Conclusion (in words): BY USING THE SINE REGRESSION, WE PREDICT NFL REVENUE (IN BILLIONS) BY 2015 WILL BEGIN TO DECLINE AT A RATE OF 13.91 B PER YEAR.

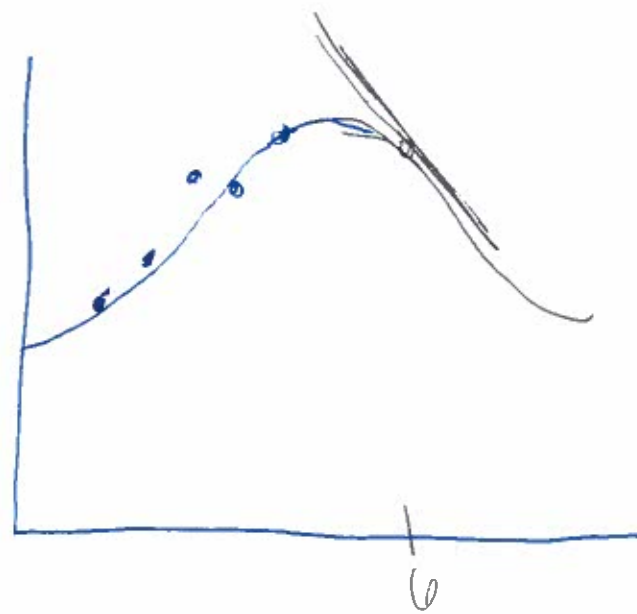
Supporting Work:

| X | Y   |
|---|-----|
| 1 | 55  |
| 2 | 75  |
| 3 | 105 |
| 4 | 102 |
| 5 | 124 |

$$34.978315056585 * \sin(.62831853071796 x + -1.5135504078853) + 83.990268861317$$

$$34.9783... * \cos(.6283... x - 1.51385...) * b$$

| X | d/dx SIN REG   |                |
|---|----------------|----------------|
|   | Y <sub>1</sub> | Y <sub>2</sub> |
| 1 | 13.909         | 56.908         |
| 2 | 21.255         | 75.092         |
| 3 | 20.481         | 96.675         |
| 4 | 11.885         | 113.41         |
| 5 | -1.251         | 118.91         |
| 6 | -13.91         | 111.07         |





GROUP NAME: Rust Nugsels

Student Names (First and Last) Kirby Mason II

Date: 11/26/14

Speaker/Presenter: Braun Reyes

Independent Variable (x-axis): ~~Year~~ Year

Writer/Prep: Greg McAlpin

Dependant Variable (y-axis): ~~years~~ % of rust

Leader/Collaborator: Harrison

Conclusion (in words): rust starts at according to our <sup>function</sup> sin reg, in <sup>the</sup> year 21<sup>st</sup> the amount of rust has decreased by 3.257% Per year

Supporting Work:

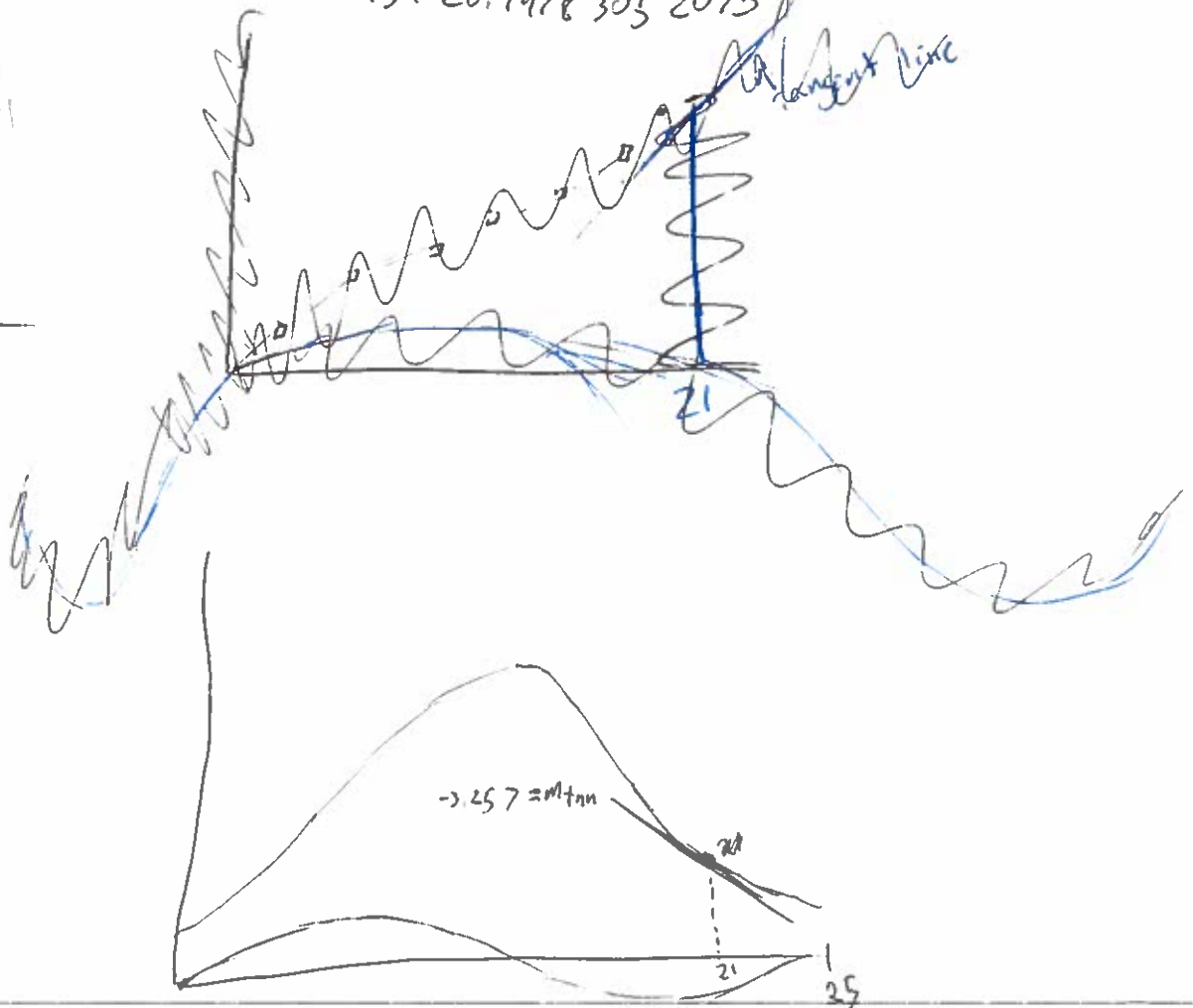
Sin data

| x | y      |
|---|--------|
| 2 | 14.123 |
| 3 | 3.555  |
| 4 | 2.177  |
| 5 | 3.653  |
| 6 | 3.4    |
| 7 | 7.2    |
| 8 | 3.2574 |

$$y_2 = 15.310137143765 \cdot \cos(0.26174938779915x + 1.734167362334) + b$$

$$y_1 = 15.310137143565 \cdot \sin(0.26174938779915x + 1.734167362334) + 20.19783052075$$

| x  | y  |
|----|----|
| 2  | 3  |
| 4  | 14 |
| 6  | 19 |
| 8  | 24 |
| 10 | 29 |
| 12 | 38 |



GROUP NAME: I ♥ Shoes

Date: 2/18/14

Independent Variable (x-axis): 300

Dependant Variable (y-axis): -66.33

Student Names (First and Last)

Speaker/Presenter: DOMINIQUE

Writer/Prep: DOMINIQUE C.

Leader/Collaborator: MARCO ANTONIO

Conclusion (in words):

AT A SALARY OF 300K we are losing ~~66.33~~ <sup>34957</sup> .16588 PAIRS OF SHOES. AT 505 we increase ~~66.33~~ pairs of shoes

Supporting Work:

$$Y_2 = 93.017085450674 \cdot \cos(0.00392699081698x - 2.2775079752175) + b$$

| X   | Y <sub>1</sub>          |
|-----|-------------------------|
| 300 | <del>66.33</del> .16588 |
| 250 | <del>66.33</del> .0992  |
| 505 | <del>66.33</del> .34957 |

$$Y'_2 = 93.017085450674 \cdot \sin(-0.00392699081698x + 2.2775079752175) + 24374819996637$$

