

Implicit

$$x^2 + y^2 = 1$$

$$-2x + y - 3 = 0$$

Explicit

$$y = \sqrt{1-x^2}$$

$$y = 2x + 3$$

Implicit Differentiation

START WITH EQUATION (Y in it)  
Take derivative of Both Sides of Equation

$$\frac{d}{dx} (2x + y - 3) = \frac{d}{dx} (0)$$

$$-2 + \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = +2$$

$$\frac{d}{dx} (x) = \frac{dx}{dx}$$

$$\frac{d}{dx} y^2 = 2y'$$

$$\frac{d}{dx} (y)^2 = 2y' \cdot \frac{dy}{dx}$$

Chain Rule

$$x^2 + y^2 = 1$$



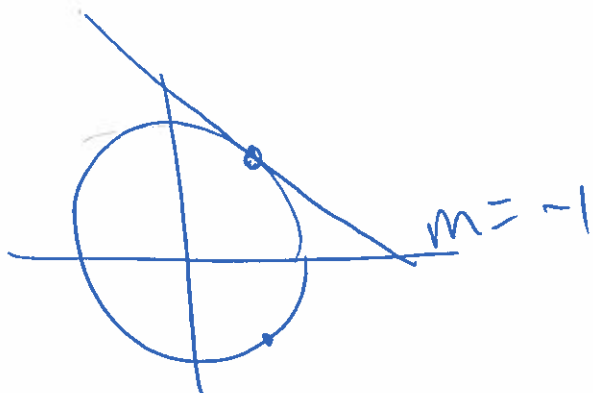
Use Implicit  
Differentiation

$$\frac{d}{dx} (x^2 + y^2) = \frac{d}{dx} (1)$$

$$2x + 2y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = \frac{-2x}{2y} = -\frac{x}{y}$$

$$\frac{dy}{dx} = -\frac{(\frac{\sqrt{2}}{2})}{(\frac{\sqrt{2}}{2})} = -1$$



$$\frac{dy}{dx} \text{ at } (0, 1) = \frac{-0}{1} = 0$$

EQ

$$y - \frac{\sqrt{2}}{2} = -1 \left( x - \frac{\sqrt{2}}{2} \right)$$

Find Equation of  
Tangent Line at  $(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$

Find Slope of  
Tangent Line or  $\frac{dy}{dx}$

Find  $\frac{dy}{dx}$  at  $(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$



What's  $\frac{d}{dx} \sin^{-1}(x) = ?$

$$\sin^{-1}(x) = y$$

$$x = \sin(y)$$

Find  $\frac{dy}{dx}$

Use Implicit

$$\frac{d}{dx} x = \frac{d}{dx} \sin(y)$$

$$1 = \cos(y) \cdot \frac{dy}{dx}$$

$$\frac{dy}{dx} = \frac{1}{\cos(y)}$$

$$\sin(y) = \frac{x}{1} = \frac{\text{opp}}{\text{hyp}}$$



$$\frac{?}{\sqrt{1-x^2}}$$

$$?^2 + x^2 = 1$$

$$?^2 = 1 - x^2$$

$$? = \sqrt{1-x^2}$$

$$\begin{aligned} \cos(y) &= \frac{\text{adj}}{\text{hyp}} \\ &= \frac{\sqrt{1-x^2}}{1} \end{aligned}$$

$$\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \sin^{-1}(x) = \frac{1}{\sqrt{1-x^2}} \quad \checkmark$$

$$\frac{d}{dx} \cos^{-1}(x) = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \tan^{-1}(x) = \frac{1}{1+x^2} \quad \checkmark$$

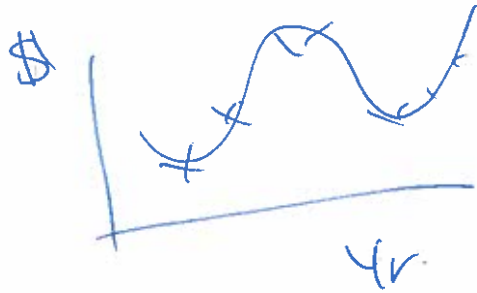
$$\frac{d}{dx} \sec^{-1}(x) = \frac{1}{\sqrt{x^2+1}}$$

$$y = f(x)$$

$$\frac{dy}{dx}$$

$$x = f^{-1}(y)$$

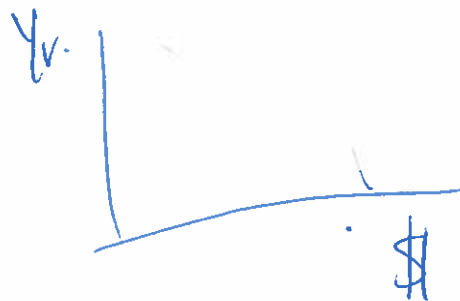
Lady G.



$$\frac{dR}{dt}$$

$$Y = A \sin(Bx + C) + D$$

$$\sin\left(\frac{Y - D}{A}\right) = Bx + C$$



$$? = dt/dR$$

When \$10,000,000  
Three years change.  
at 01 Yrs/\$

$$\left(\sin^{-1}\left(\frac{Y - D}{A}\right) - C\right) \frac{1}{B} = X$$

$$Y_1 = \left(\frac{1}{B}\right) \left(\sin^{-1}\left(\frac{X - D}{A}\right) - C\right)$$

$$Y_2 = \text{nder}(Y_1, X, X)$$

$$Y_1 = \left( \sin^{-1} \left( \frac{(x-D)}{A} \right) - c \right) / B$$

$$Y_2 = \text{nderiv}(Y_1, x, x)$$

$$X = \underline{\text{Revenue}}$$

$$Y = \underline{\text{Year}}$$

at  $x =$   
Find  $\frac{dy}{dx} = \frac{\$}{\$}$

$$\cosh(x) \equiv \frac{e^x + e^{-x}}{2}$$



$$\sinh(x) \equiv \frac{e^x - e^{-x}}{2}$$



$$\tanh(x) \equiv \frac{\sinh(x)}{\cosh(x)}$$

$$\coth(x) = \frac{1}{\tanh(x)}$$

$$\frac{d}{dx} \cosh(x) = \sinh(x)$$

NO SIGN CHANGES

$$\operatorname{sech}(x) = \frac{1}{\cosh(x)}$$

$$\frac{d}{dx} \sinh(x) = \cosh(x)$$

$$\operatorname{csch}(x) = \frac{1}{\sinh(x)}$$

$$(\cosh(x))^2 - (\sinh(x))^2 = 1$$

$$\frac{d}{dx} \tanh(x) = \frac{d}{dx} \frac{\sinh(x)}{\cosh(x)}$$

$$\frac{\cosh(x) \cosh(x) - \sinh(x) \sinh(x)}{(\cosh(x))^2} = \frac{1}{\cosh^2(x)}$$
$$= \operatorname{sech}^2(x)$$

<p><b>GROUP NAME:</b> <u>The Scientists</u></p> <p><b>Logo:</b></p>	<p><b>Student Names (First and Last)</b></p> <p><b>Speaker/Presenter:</b> <u>Nicole</u></p>
<p><b>Date:</b> <u>10/2/13</u></p> <p><b>Topics:</b> <u># of extinct species</u></p>	<p><b>Writer/Prep:</b> <u>Darin Cebratison</u></p> <p><b>QC/Leader:</b> <u>Kiersten Hendricksen</u></p>

**Instructions:**

$y = A \sin(Bx + C) + D$	x	$Y_1$	$Y_2$
	705	.03813	.00157
$Y_1 = \sin^{-1}((x - D)/A) - C/B$	750	.16612	.00146
	<u>800</u>	.17731	.0014
$Y_2 = nDeriv(Y_1, x, x)$	825	.21206	.00138
	850	.24664	.00138
	900	.31636	.00141
	905	.32344	.00142

When the number of extinct species was 800, at the beginning of 2008 and was increasing at a rate of .0014 species per year.



<p>GROUP NAME: <u>CSC</u></p> <p>Logo: <u>CSC</u></p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>CORNEAL</u></p>
<p>Date: <u>10/2/13</u></p> <p>Topics:</p>	<p>Writer/Prep: <u>COURTNEY</u></p> <p>QC/Leader: <u>STEPHEN</u></p>

Instructions: APPLE STOCK PRICES.

Data

X	Y
09	211.98
10	336.12
11	405.00
12	532.17
13	501.02

$$y_1 = \frac{(\sin^{-1}((x-d)/b)) - c}{b}$$

$$y_2 = n \text{Deriv}(y_1, x, x)$$

X	Y
09	1.7970195
336.12	2.9172193
405.00	3.4132200
532.17	3.79811
501.02	4.4179



@ 206 - APPLE STOCK PRICES

GROUP NAME: Time Is Money



Logo:

Student Names (First and Last)

Speaker/Presenter: Angelika Mazurek

Writer/Prep: Shyam Singh (Shiv)

QC/Leader: Eugenio Pelaez

Date: 10/2/13

Topics:

Instructions:

iPhone 4S sales

**Stat** 1: Edit

L1	L2
1	200
2	350
3	200
4	199
5	250

**Stat** Calc

C: Sin Reg <enter>

$$Y_1 = (\sin^{-1}((x-d)/a) - c) / b$$

$$Y_2 = n \text{ Deriv}(Y_1, x, x)$$

**2nd** Table

x	Y1	Y2
300	1.715	.01397
170	.54196	.01624
310	1.9196	.03728
200	.86785	.00853


X = \$ amount

Y1 = Years

Y2 = rate of change per Year.

When iPhone 4S was @ \$ 200 it's rate of change was .00853 yr/\$.

$$.00853 \times 365 = 3.1134E$$

<p>GROUP NAME: IRISH MATH BOMBS</p> <p>Logo: </p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>Bobby O'Connor</u></p>
<p>Date: _____</p> <p>Topics: _____</p>	<p>Writer/Prep: <u>Connor Krupsmen</u></p> <p>QC/Leader: <u>Bill Nye <sup>I</sup> loves math Guy</u></p>

Instructions:

X	Y <sub>1</sub>	Y <sub>2</sub>
3	2.6565	1.3291
5	3.9936	1.374
7	8.1843	1.4672
9	11.275	1.6428
11	14.876	2.0091
13	19.792	3.2252

when the price of PBR was 7\$  
~~In year 2007 the price~~  
~~of PBR was increasing~~  
~~1.4672\$~~  
 It was 2008.2 and  
 charging at 1.46 years  
 per dollar.

year	Original price \$
3	13
5	15
7	16
9	19
11	20
13	21

<p>GROUP NAME: <u>Wolf Pack</u></p> <p>Logo:</p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>Jared</u></p>
<p>Date: <u>10-2</u></p> <p>Topics:</p>	<p>Writer/Prep: <u>Dominic DC</u></p> <p>QC/Leader: <u>Ray</u></p>

Instructions:

$$Y_1 = 5362.0582479942 * \ln[ (.37636330660922X) + (-.81615625317437) ] + 3943.5450581147$$

$$Y_2 = nDERIV (Y_1, X, X)$$

$$Y_3 = [ (\ln^{-1}((X - 3943.545058) / 5362.058248) - (-.8161562532) ) / .3763633066$$

$$Y_4 = nDERIV (Y_3, X, X)$$

X	Y <sub>3</sub>	Y <sub>4</sub>
14	260.4	0.04219
28	2073.8	0.02219
156	1360.7	0.04574
6003	6270.9	0.04716
10000	9209.5	0.04929
6000	7116.7	0.05142
1000	-162.4	0.05425

IN YEAR 2013 THE CHANGE IS  
 -162.4 YEARS / KB/6 AND ITS  
 RATE OF CHANGE IS 0.05425  
 @ THAT TIME.

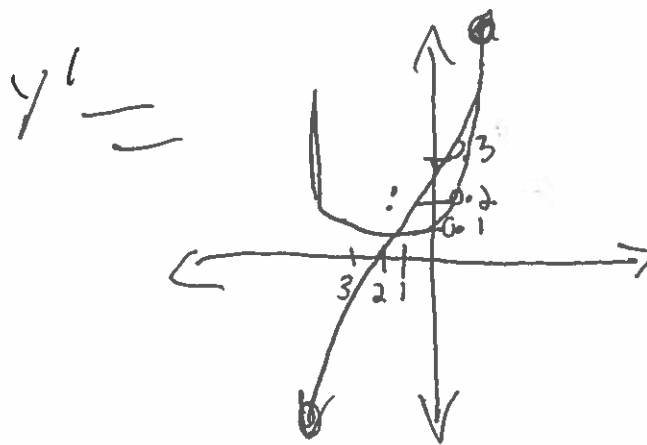
GROUP NAME: apples 2 apples	Student Names (First and Last)
Logo:	Speaker/Presenter: <del>Steve</del> Thomas Y
Date: 10/02/13	Writer/Prep: <del>Thomas</del> Steve A
Topics:	QC/Leader: Anna S

Instructions: derivative of  $\sin^{-1}$

$$y' = \sin^{-1}((x-D)/A) - C) / B$$

$$\sin^{-1}((x - 2.1599) / 3.409) - (-1.2267) / 2.159872$$

Days	Hours	$y_1$	
1	10		
2	7		
3	4		
4	9	0.08416	0.27058
5	6.5	0.28128	0.16551
6	4.5	0.43713	0.1414
7	11	0.53497	0.13583



When our instantaneous rate of change is  $29345 \frac{\text{days}}{\text{hour}}$  our hours of sleep are 150449 and the day is day  $1 \frac{\text{day}}{\text{hour}}$

GROUP NAME: Mathletes



Date: 10/2

Topics: derivative of  $\sin^{-1}$

Student Names (First and Last)

Speaker/Presenter: Kyle Inverso

Writer/Prep: Logan Hadley

QC/Leader: Aidan Callahan

Instructions:

derivative of  $\sin^{-1}$

$a = 7,716096221$

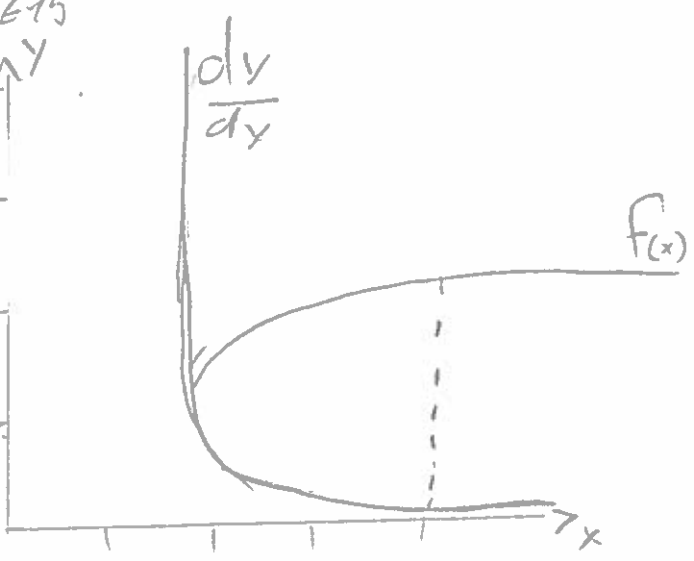
$b = 1,019561588$

$c = -2,375841326$

$d = 6,566572615$

$$f(x) = \frac{\sin^{-1}\left(\frac{x-d}{a} - c\right)}{b}$$

for  $\frac{dy}{dx}$  speed (in mph)  $\uparrow$  y  
 120 mph per hour  
 90 mph per hour 90 mph  
 60 mph per hour 60 mph  
 30 mph per hour 30 mph



~~SP~~  
 The car stops accelerating at four seconds

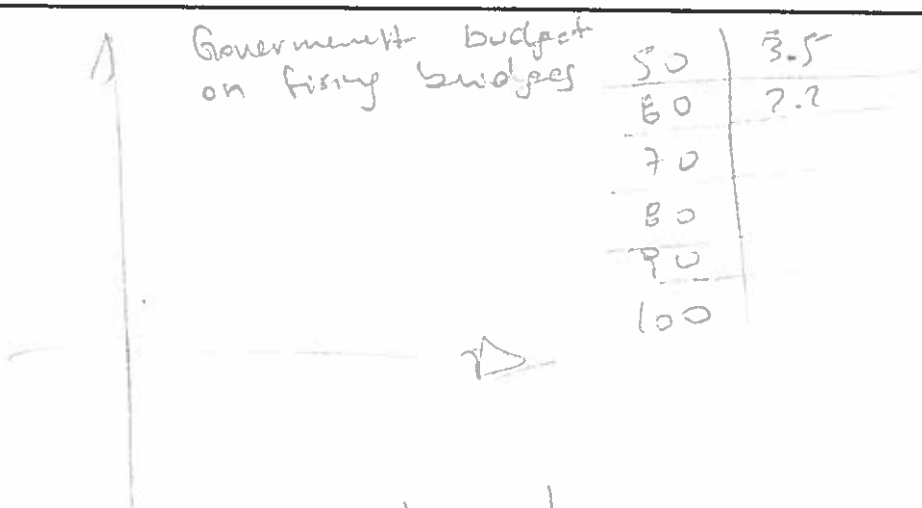
time (in seconds) merging onto the interstate

Car's speed after ~~merging onto the interstate~~

~~x = speed~~  
 $f(x) = \text{acceleration}$   
 $x = \text{time}$   
 $f(x) = \text{speed}$   
 $\frac{dy}{dx} = \text{acceleration}$

<b>GROUP NAME:</b> THE FACTORS <b>Logo:</b> <b>Date:</b> 10/07/13 <b>Topics:</b>	<b>Student Names (First and Last)</b> <b>Speaker/Presenter:</b> _____ <b>Writer/Prep:</b> Kevin Chang <b>QC/Leader:</b> Ethen Stewart
---	--

**Instructions:**



x	y <sub>1</sub>	y <sub>2</sub>
0.1	-2.06	-20.63
1	-22.07	-25.75
1.1	-24.71	-27.42
1.2	-27.57	-29.68
1.3	-30.71	-32.93

first year Gov. spends -22.07 Budget  
 at a rate of -25.75.