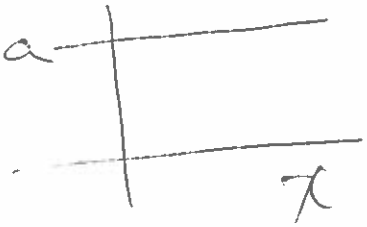
Implicit Differentiation

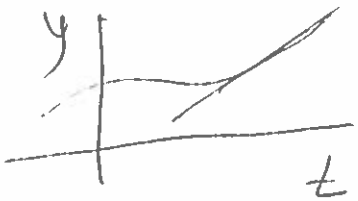
derivate of both side.

$$\frac{d}{dx} f(x,y) = \frac{d}{dx} g(x,y)$$

$$\frac{d}{dx} a \quad (\text{constant}) = 0$$



$$\frac{d}{dt} y \quad \text{(variable)} = \frac{dy}{dt}$$



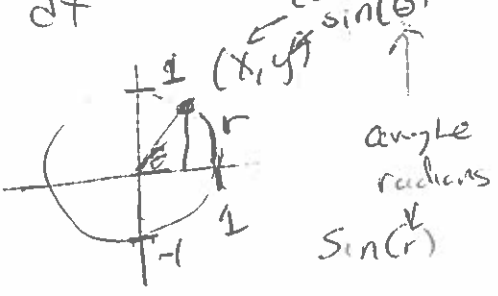
$$\frac{d}{dx} \sin(\cdot y) = \cos(\cdot y) \cdot \frac{dy}{dx}$$

Chain Rule

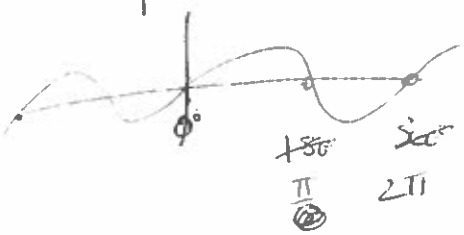
$$y = \sin^{-1}(x) \iff x = \sin y$$

explicit

$\frac{dy}{dt}$



X	Y = Sin(x)
Degrees	Value



Value	Degrees

$x = \sin y$ want $\frac{dy}{dx}$

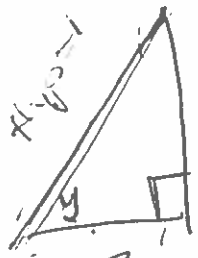
$\frac{d}{dx} x = \frac{d}{dx} \sin y$

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

Original

$\sin y = \frac{x}{1}$

$\sin = \frac{opp}{hyp} = \frac{x}{1}$



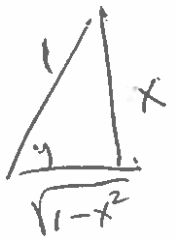
$? = \sqrt{1-x^2}$

Pythagorean Theorem

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

$?^2 = 1 - x^2$

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



$\cos y = \frac{adj}{hyp} = \sqrt{1-x^2}$

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

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

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

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

Trig: $\sec^{-1}(x)$, $\csc^{-1}(x)$, $\cot^{-1}(x)$

e^x, $\ln x$ — $e^{\ln x} = x$

Calc: $\cosh^{-1}(x)$, $\sinh^{-1}(x)$

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

$x = \cosh(y)$

implicit diff

$\frac{dy}{dx}$

$1 = \sinh(y) \cdot dy/dx$

$\frac{1}{\sinh(\cosh^{-1}(x))} = \frac{1}{\sinh(y)} = dy/dx$

Ex $y = \ln x \Rightarrow x = e^y$

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

$$1 = e^y \cdot \frac{dy}{dx}$$

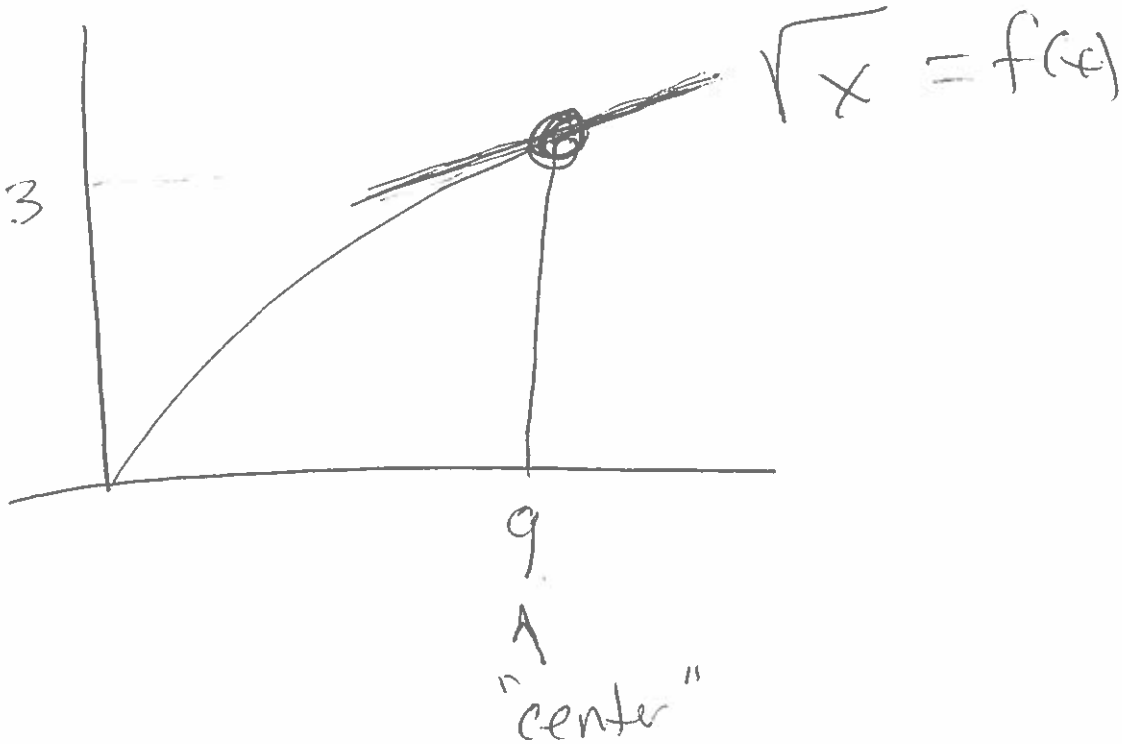
$$= e^{-\ln x} = e^{-y} = \frac{1}{e^y} = \frac{dy}{dx}$$

$$e^{\ln x^{-1}} = x^{-1}$$

$y = \ln x$

$$\frac{dy}{dy} = \frac{1}{x}$$

Linearize a Function



1. Find Equation of Tangent Line at a center.

Slope of tangent Line $m_{tan} = f'(x_0)$

Point $(9, 3.)$
$(x_0, f(x_0))$

$f(x) = \sqrt{x} = x^{1/2}$

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

$f'(9) = \frac{1}{2} \frac{1}{9^{1/2}}$
$= \frac{1}{2} \frac{1}{3} = \frac{1}{6}$

$y - y_1 = m(x - x_1)$

$y - 3 = \frac{1}{6}(x - 9)$

or

$y = 3 + \frac{1}{6}(x - 9)$

$f(x) = 3 + \frac{1}{6}(x - 9)$

$f(11) = 3 + \frac{1}{6} 2 = 3\frac{1}{3}$

Test 1 Spring 2014

PreCalculus / Mat146

Prof. Porter

Student Name/ID: Dorian Thomas

1. Suppose that the function g is defined , for all real numbers, as follows.

$$g(x) = \begin{cases} -1 & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$$

Graph the function g .

2. Choose the end behavior of the graph of each polynomial function.

(a) $f(x) = -6x^6 - 6x^5 + 3x^2 + 7$

{(a) Rises, (b) Falls} to the left and
{(a) rises, (b) falls} to the right.

Same behavior

(b) $f(x) = -6x^3 - x^2 - 2x + 1$

{(a) Rises, (b) Falls} to the left and
{(a) rises, (b) falls} to the right.

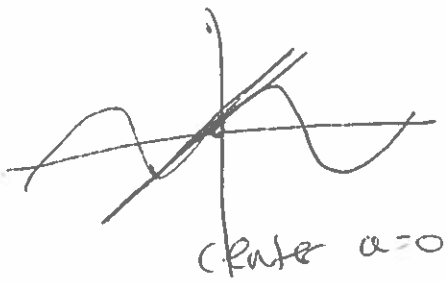
Opposite

(c) $f(x) = 4(x-3)^2(x+2)^2$

{(a) Rises, (b) Falls} to the left and
{(a) rises, (b) falls} to the right.

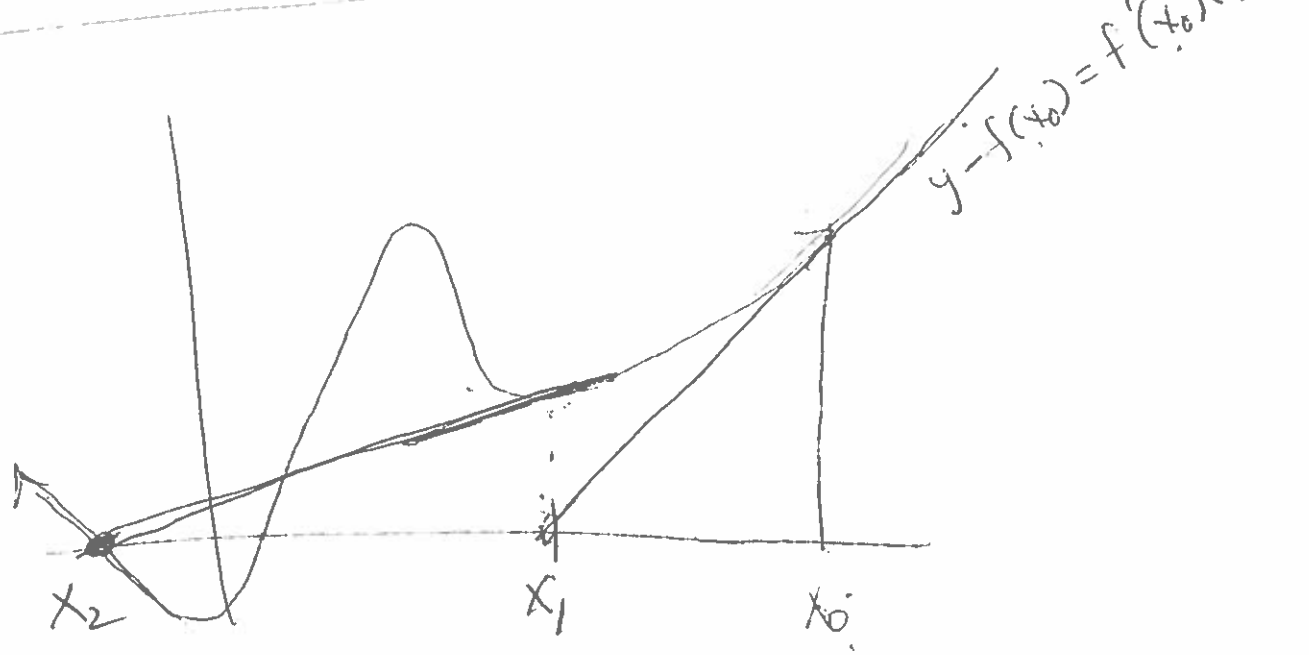
Same right

Ex Sin $[H^+] \simeq [H^+]$



$\sin x = x$

Newton's Method for Finding Zeros



Initial Guess

$$0 - f(x_0) = f'(x_0)(x_1 - x_0)$$

$$x_1 = x_0 - f(x_0) / f'(x_0)$$

$$x_2 = x_1 - f(x_1) / f'(x_1)$$

① Cubic Regression

Y_1 = cubic Regression

② Guess a value.

$X = 2010$

2010 STO→ X

X − Y_1 / nderiv(Y_1, X, X)

1985 STO→ X

1960.40

③ In 1960 MJ was worth Nothing

GROUP NAME: M Science

Date: 27 FEB 14

Student Names (First and Last)

Speaker/Presenter: Corinna Hansen

Writer/Prep: Lindsey Lansberry

Leader/Collaborator:

Independant Variable (x-axis): time (hrs)

Dependant Variable (y-axis): Concentration (PPM)

Conclusion (in words):

At -4.119 hrs drug concentration was at 0 PPM

Supporting Work:

time (hrs)	Concentration (PPM)
0	100
1	84
2	68
3	46
4	29
5	22

$Y_1 = .768\ldots x^3 + (-5.03\ldots x^2) + (-9.61x) + 99.51.$

Guess

$3 \to x$

$Y_1 = 46.126\ldots$

$x - Y_1 / nDeriv(Y_1, x, x) = 5.420\ldots$

$= -.7215\ldots$

$= 84.8249\ldots$

$= -4.119\ldots$

GROUP NAME: El Business

Date: 2/27/14

Student Names (First and Last)

Speaker/Presenter: Ryan

Writer/Prep: Brittany

Leader/Collaborator: Andy

Independant Variable (x-axis): world cups

Dependant Variable (y-axis): goals

Conclusion (in words): In the 9th world cup goals will not be scored.

Supporting Work:

[Y=] [STAT] ⊳ Calc 6: [enter]

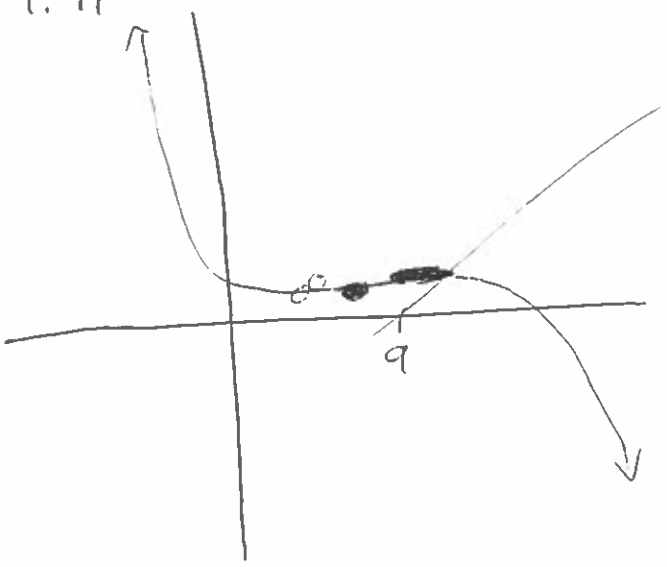
[Y=] [Vars] ⊳ y-vars [STAT] 5: ⊳ ⊳ 1:

X = 50

[X] [=] [Vars] ⊳ y-vars 1: [enter] [math] 8: [Vars] ⊳ 1: [enter]

[9] × [9] × [1] [STO>] × [=]

9.41



GROUP NAME: I ♡ shoes

Date: 2/28/14

Student Names (First and Last)

Speaker/Presenter: Val Sinclair

Writer/Prep: Dominique C.

Leader/Collaborator: Hansen

Independant Variable (x-axis): years

Dependant Variable (y-axis): Dogs

Conclusion (in words): In 2021 there will ~~be~~ no longer be any dog owners

Supporting Work:

CubicReg

$y = ax^3 + bx^2 + cx + d$

$a = -.055530089$

$b = 1.037830853$

$c = -4.888607432$

$d = 20.86017343$

X	Y
3	17
6	28
7	39
9	41
10	59
14	70

15 → X

15

X − Y1 / nDeriv(Y1, X, X) → X

83.92158843

21.54636879

GROUP NAME: Harry Porter

Date: 2/27/14

Student Names (First and Last)

Speaker/Presenter: Mishka

Writer/Prep: Anik P

Leader/Collaborator: [illegible] V

Kevin I : Trainee

Independant Variable (x-axis): hours of Party

Dependant Variable (y-axis): alcohol drunk (liters)

Conclusion (in words): you need more rookies

In the first hour nobody drunk anything

Supporting Work:

X	Y
1	30
2	55
3	80
4	100
5	120

20

14.39

10.33

5.85

1.77

.24

.33

.327

X-Y1/nDerv(Y1, X, X) → X