151 MW
DAY 10

Newton's method for Finding Zeros

Can be used to solve
Any Equation
A = B or A - B = 0

[Like the Solver on calculator]
(uses 1st derivative)

Implicit Differentiation

Ex $\sin(xy) = e^y$ Find dy/dx

$\frac{d}{dx}(\sin(xy)) = \frac{d}{dx} e^y$ Chain Rule.

$\cos(xy) \cdot \frac{d}{dx}(xy) = e^y \cdot \frac{dy}{dx}$

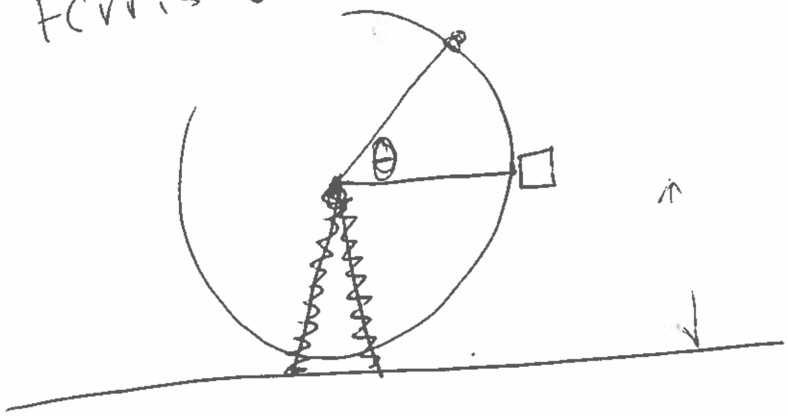
Product

$\cos(xy)\left[x \frac{dy}{dx} + y\right] = e^y \frac{dy}{dx}$

$x\cos(xy) \frac{dy}{dx} + y\cos(xy) = e^y \frac{dy}{dx}$

$\boxed{\frac{dy}{dx} = \frac{y\cos(xy)}{e^y - x\cos(xy)}}$ = $\frac{dy}{dx} \cdot \frac{e^y - x\cos(xy)}{e^y - x\cos(xy)}$

Ferris wheel



x	
0	220'
15	440
30	220
45	0
60	220

$$y = 220 \sin(.1x) + 220$$

$$\frac{y-220}{220} = \frac{220 \sin(.1x)}{220}$$

$$\frac{y-220}{220} = \sin(.1x)$$

$$\sin^{-1}\left(\frac{y-220}{220}\right) = .1x$$

$$x = 10 \sin^{-1}\left(\frac{y-220}{220}\right)$$

$$\frac{1}{220}$$

$$\frac{dx}{dy} = 10 \frac{1}{\sqrt{1-\left(\frac{y-200}{220}\right)^2}} \cdot \frac{d}{dy}\left(\frac{y-220}{220}\right)$$

$$y = A \sin(Bx + c) + D$$

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

1. Find sine regression

Sinreg 1, L1, L2, $\frac{88}{\text{Period}}$

↑ [2nd][1]   ↑ [2nd][2]   ($\Delta X \cdot 2$)

X = years   y = MJ Sales

2. Find $\sin^{-1}$ function.

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

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

X = MJ Sales   y = years

3. Use Table to make a predicti

X	Y_2
30 million in sales	1.66 years / million sales

"When MJ is making 30 million he could expect 1.66 yrs to go by before his next million

$$\frac{d}{dx} \sin^{-1}\left(\frac{y - B}{A}\right) =$$

$$\frac{1}{\sqrt{1 - \left(\frac{y - B}{A}\right)^2}} \cdot \frac{d}{dx}\left(\frac{y}{A}\right)$$

$$\frac{y - D}{A} \leq 1$$

$$y_2 = 1/\sqrt{(1 - ((y - d)/A)^2)} \cdot (1/A)(y/B)$$

Properties of Logs

1. Definition $Y = B^X \quad X = \log_B Y$
2. Sum/Product $\ln A + \ln B \rightarrow \ln A \cdot B$
3. Ladder $\log B^X \rightarrow X \log B$
4. Change of Base $\log_B A \Rightarrow \dfrac{\log_X A}{\log_X B}$
5. log of both Sides $X = Y \quad \log A = \log B$

$$\log \frac{X}{B} = \log X - \log B$$

Logarithmic Differentiation

1. Log of Both Sides.
2. Use properties of logs above
3. Differentiate Implicitly
4. Algebra to find dy/dx

Candidate

$$y = \left(f(x)\right)^{g(x)}$$

$$y = \left(\cos(x)\right)^{x}$$

~~$\frac{d}{dx} e^{x} \neq x e^{x-1}$~~

(1) $\ln y = \ln\left(\cos(x)\right)^{x}$

(2) $\ln y = x \ln\left(\cos(x)\right)$

(3) $\frac{d}{dx} \ln y = \frac{d}{dx}\left(x \cdot \ln(\cos(x))\right)$

$$\frac{1}{y} \cdot \frac{dy}{dx} = x \cdot \frac{d}{dx} \ln(\cos(x)) + \ln(\cos(x))$$

(Product Rule)

Chain Rule

$$= x \frac{1}{\cos x} \cdot -\sin x + \ln(\cos x)$$

Chain Rule.

$$= -x \tan x + \ln(\cos x)$$

$$\frac{1}{y}\frac{dy}{dx} = -\frac{x\sin x}{\cos x} + \ln(\cos x)$$

$$\frac{dy}{dx} = y\left[-\frac{x\sin x}{\cos x} + \ln(\cos x)\right]$$

$$= (\cos x)^{x}\left[-\frac{x\sin x}{\cos x} + \ln(\cos x)\right]$$

x^{x} or $(\sin x)^{\cosh x}$ or $x^{\sin x}$

$g(x)\ln(f(x))$

CRAP

$$\frac{d}{dx}\ln y =$$

$$\frac{1}{y}\frac{dy}{dx} =$$

GROUP NAME: MONEY MAKERS Date: 3/5/14	Student Names (First and Last) Speaker/Presenter: Brian S. Writer/Prep: Edna Leader/Collaborator: Monica V.
Independant Variable (x-axis): time Dependant Variable (y-axis): percent of crime	

Conclusion (in words): Every 11.88 ≈ 12 years, crime percentage goes up .46%. When crime rate is 46% takes 11.88 years to go up to 100%

Supporting Work:

1 sin regression -> sin reg 1, L1, L2, 8

$y = 187.0707611 \cdot \sin(-1.420307551x + -1.3742115) + .5411955993$

2. $\sin^{-1}$ regression

$y_1 = (\sin^{-1}((x - .5411955993)/187.0707611) - 1.3742115) / -1.42030755$

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

=> inverse equation = $y = a \cdot \sin(bx + c) + d$

a = 1.434437004

b ..7853981634

c. 1.038985471

d = .5553760075

3.

X	Y
.46	11.884

GROUP NAME: Cha- Ching

Date: 03/05/14

Independant Variable (x-axis): ~~Years~~ Revenue

Dependant Variable (y-axis): ~~Revenue~~ Yrs

Student Names (First and Last)

Speaker/Presenter: Sheila Mae Gan

Writer/Prep: Tatiana Calderon

Leader/Collaborator: Trey Murrill

Conclusion (in words): When we ~~while~~ are making 24 million. We could expect 0.14 years to go by before we make another million

Supporting Work:

L_1	L_2
13	35
12	27
11	26
10	17
9	16

a.

X	Y_1	Y_2
24	3.08	.14503

0.14 years/million

GROUP NAME: We mean business

Date: 3/5/14

Student Names (First and Last)

Speaker/Presenter: Simar Kalra

Writer/Prep: Christina Trujillo

Leader/Collaborator:

Independant Variable (x-axis): interest rates

Dependant Variable (y-axis): years

Conclusion (in words):
At 4% interest rate, it would take 1yr. to increase by 1%.

Supporting Work:

years / interest rates

X	Y
8	3.71
9	1.53
10	.29
11	.38
12	.58

Inverse

x	y_2
0	2.5 yr/1% interest rate
1	.67
2	.57
3	.61
4	1.0
5	error

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

$y_2 = \text{nDeriv}(Y_1, X, X)$

GROUP NAME: TI rates

Date: 03/[illegible]/2014

Independant Variable (x-axis): ~~Years~~ Sales in million

Dependant Variable (y-axis): ~~Sales~~ Yrs

Student Names (First and Last)

Speaker/Presenter: Sharonlsoe

Writer/Prep: Onur Turkan

Leader/Collaborator: Purav Patel

Conclusion (in words): when pink auto seller is at 45 million -The could [illegible] 4.4 years to go by [illegible] the next million

Supporting Work:

x	y
1	50
5	46
8	34
11	55
12	51
14	25

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

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

x	Y_1	Y_2
45	6.2634	4.421
55	[illegible]	[illegible]

$dy/dx = 4.4$ yrs/million Cars

GROUP NAME: [illegible]

Date:____________

Independant Variable (x-axis): year

Dependant Variable (y-axis): # Death [illegible] millions

Student Names (First and Last)

Speaker/Presenter: Kausalya Mannville

Writer/Prep: Frehiwot [illegible]

Leader/Collaborator:____________

Conclusion (in words):
when there are 2.6 million people dying, we could expect 1.23 years to go buy before the [illegible] because of Aids

Supporting Work:

x	y
2009	2.1
2010	2.3
2011	2.6
2012	2.4
2013	2.7

Sin Reg

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

a = 308.0

b = .113

c = -2.5

d = 2.3

Sin Reg 1, L1, L2, 8

a = .24

b = .78

c = -1.94

d = 2.37

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

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

3. Table

$x = 2.6$ $y_1 = 3.675$

deri $y_2 = 1.23$

GROUP NAME: Functional Paradigm

Date: 03/05/14

Student Names (First and Last)

Speaker/Presenter: Nader Shenouda

Writer/Prep: Karol Zarski

Leader/Collaborator:

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

Dependant Variable (y-axis): memory usage (MB)

Conclusion (in words):

When 1800 MB are used, another MB will be used in 5.36 seconds.

Supporting Work:

X	Y
0	1000
1	1500
2	2500
3	2250
4	2600

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

$Y_2 = \text{nDeriv}(y_1, X, x)$

Guess = 1800 $y_1 = 1.3384$ $y_2 = .00149$

so in 5.36 seconds, one MB will be used up

GROUP NAME: (BEST FRIENDS)-(ELIOT)

Date: 03/05/2014

Independant Variable (x-axis): YEARS

Dependant Variable (y-axis): NUMBER OF ELECTRIC CARS SOLD

Student Names (First and Last)

Speaker/Presenter: [illegible]

Writer/Prep: LAUREN DOBU

Leader/Collaborator: ______

Conclusion (in words):

WHEN CAR SALES REACH 500,000, IT WILL TAKE 33 MINUTES TO SELL ONE CAR.

Supporting Work:

x YEAR	y CARS
2009	290292
2010	274555
2011	284064
2012	487480
2013	592192

X	Y_1	Y_2	Y_3
2010	[illegible]	-37134	ERROR
500000	[illegible]	15511	~~[illegible]~~ 6.3E-6

SinReg

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

$a = 170314.8844$

$b = 1.272131334$

$c = -1.470607369$

$d = 384709.1247$

$Y_1 = a\sin(bx+c)+d$

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

$Y_3 = (\sin^{-1}((X-d)/a)-c)/b$