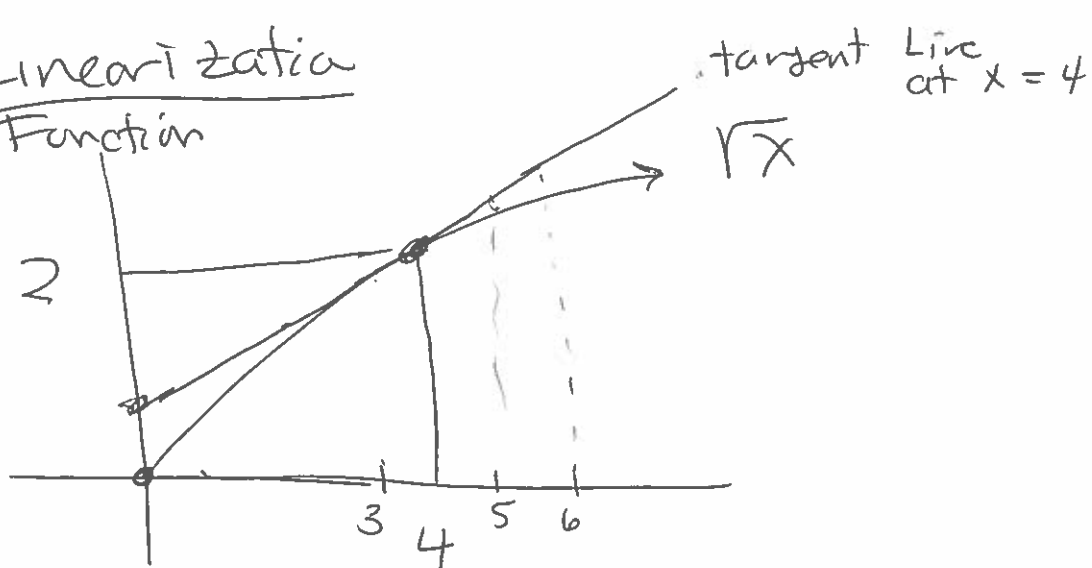


# Local Linearization of a Function



center. (near the value we want)

Find Equation of Tangent line near  $x = 4$  for  $y = \sqrt{x} = x^{1/2}$

$\sqrt{5}$  or  $\sqrt{3}$

We need  $\rightarrow$  slope + Point

$$y' = \frac{1}{2} x^{-1/2}$$

$$(4, 2)$$

$$y'(4) = \frac{1}{2} (4)^{-1/2} = \frac{1}{2} \cdot \frac{1}{2}$$

$$(a, f(a))$$

$$f'(a) = \frac{1}{4}$$

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

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

$$y = f(a) + f'(a)(x - a)$$

$$\sqrt{x} \approx 2 + \frac{1}{4}(x - 4)$$

$$\sqrt{5} \approx 2 + \frac{1}{4}(5 - 4) = 2.25$$

Ex  $\sin(x)$  when  $x$  is small

$a=0$  center

$$f(a) = \sin(0) = 0$$

$$m = f'(a)$$

$$= \cos(0) = 1$$

$(0, 0)$

$$y = 0 + 1(x - 0) = x$$

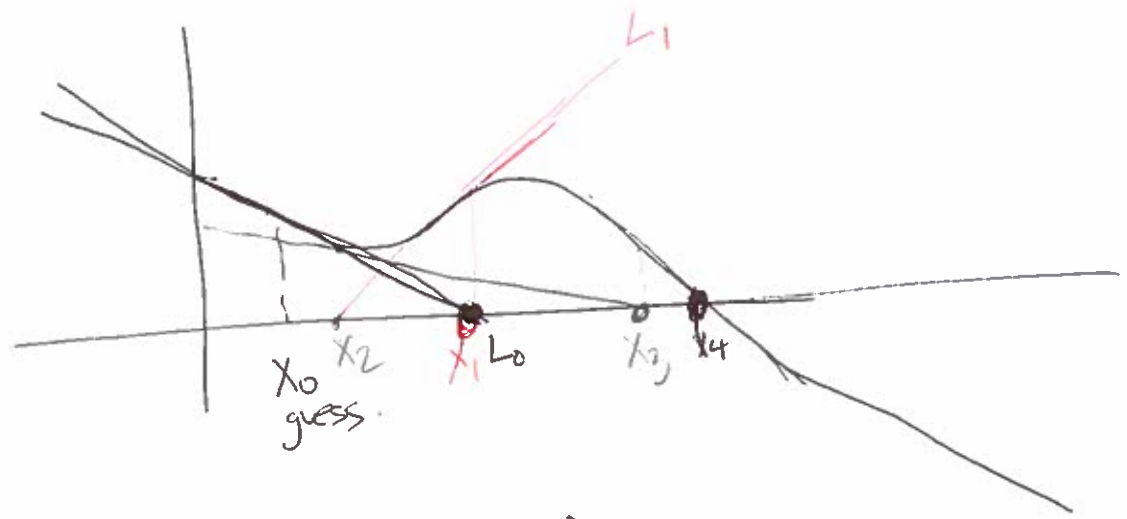
$\sin(x) \approx x$  when  $x$  is small.

Differentials

# Newton's Method for Finding Zeros

---

$$f(x) = 0$$



$$L_0: y = f(x_0) + f'(x_0)(x - x_0)$$

$$0 = f(x_0) + f'(x_0)(x - x_0)$$

$$-\frac{f(x_0)}{f'(x_0)} + x_0 = x$$

Next Guess  $x_0 - \frac{f(x_0)}{f'(x_0)}$

$$L_1: x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)}$$

$$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)}$$

$x_5 = \text{same}$

$x_6$

$x_7$

start  $x_0 = 10$  guess

$$x_1 = x_0 - f(x_0) / f'(x_0)$$
$$= 10 - 19.424 / 0.80572$$

$$x_1 = -14.10$$

$$x_2 = -14.10 - f(-14.10) / f'(-14.10)$$
$$= -14.10 - 20.977 / (-0.1845)$$

$$= ~~99.58~~ - 6.805 \dots$$

Better Way

guess STO  $\rightarrow$  X

$X - Y_1 / \text{nderiv}(Y_1, X, X) \xrightarrow{\text{STO}} X$

<enter>

ZC00 = 23.02

$$x_0 = 10$$

$$x_1 = -14.10$$

$$x_2 = -6.805$$

$$x_3 = -0.1919$$

$$x_4 = 45.28$$

$$x_5 = 33.78$$

27  
23

<p>GROUP NAME: <u>4-4-00</u></p> <p>Logo:</p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>Ellen Sigmund</u></p>
<p>Date: <u>10/1/12</u></p> <p>Topics: <u>Newton's Method</u></p>	<p>Writer/Prep: <u>Luca Sigmund</u></p> <p>QC/Leader: <u>Ryan Bigley</u></p>

Instructions:

(1)  $f(x) = x^2 - 2x + 1$

$510 \rightarrow 200$

$x = \frac{1 \pm \sqrt{1 - 4(1)(1)}}{2(1)}$

$510 \rightarrow x$

$x_1 = 2, x_2 = 0$

$x_3 = 1$

$x_4 = 1$


$x_5 = 1$

$x_6 = 1$

In the next slide, we will see the Newton-Raphson method for finding roots of a function.

The Newton-Raphson method is a way of finding the roots of a function.

It is a very powerful method.

GROUP NAME: Mathletes  
 Logo: 

Student Names (First and Last)  
 Speaker/Presenter: Aidan

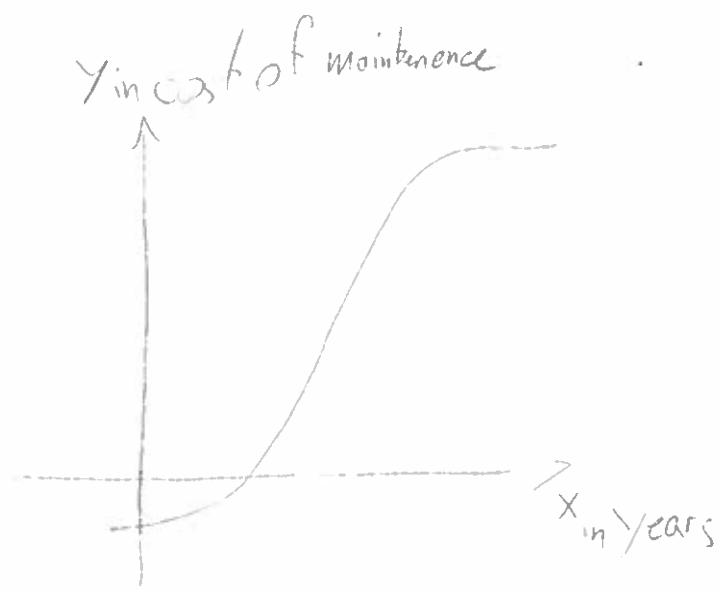
Date: 10/09/2012  
 Topics: Finding Zero

Writer/Prep: Logan H  
 QC/Leader: Aidan Logan

Instructions: How do you find the zero

Guess  
 $5 \Rightarrow 10$   

$$x = \frac{y_1}{\ln(\text{deriv}(y_1) \cdot x_{i-1})} \Rightarrow x$$
  
 $x_1 = 2,68970557$   
 $x_2 = 2,527690503$   
 $x_3 = 2,523430184$   
 $x_4 = 2,523427044$  ~~Zero~~

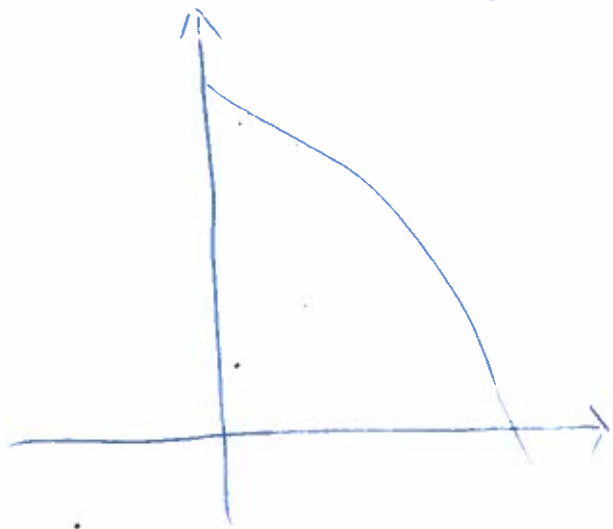


<p>GROUP NAME: Apples 2 Apples</p> <p>Logo:</p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: Steven H</p>
<p>Date: 10/9/13</p> <p>Topics:</p>	<p>Writer/Prep: ANNA S</p> <p>QC/Leader: Steven H</p>

Instructions: Newton's method for finding zero

~~GROUPS~~  
~~1~~  
~~2~~  
~~3~~  
~~4~~  
~~5~~  
~~6~~  
~~7~~

$1 \rightarrow x_0$	9.2036
$x_1$	7.3964
$x_2$	6.1938
$x_3$	6.1303236 ← zero



Battery power

GROUP NAME: Time Is Money



Logo:

Student Names (First and Last)

Speaker/Presenter: Angelika Mazurek

Writer/Prep: Shviam Singh (Shiv)

QC/Leader: ~~Angelika Mazurek~~

Date: 10/9/13

Topics:

Instructions:

iPhone 4S video

[STAT] video

Y = Cubic Eq  
x = 5

Y = Cubic Eq

x = 5

Y = 9 'n down' x = 5

Y = 9 'n down' x = 5

Y = 9 'n down' x = 5

Y = 9 'n down' x = 5

Y = 9 'n down' x = 5

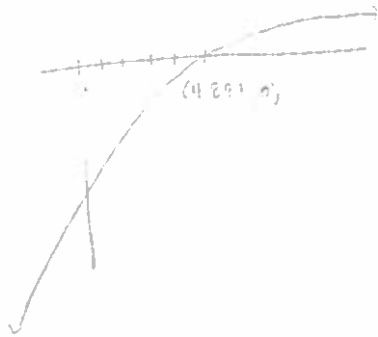
Y = 9 'n down' x = 5 started.



<p>GROUP NAME: <u>110941010</u></p> <p>Logo:</p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>Nicole</u></p>
<p>Date: <u>10/9/13</u></p> <p>Topics: <u>11-3</u></p>	<p>Writer/Prep: <u>Darin Coccolison</u></p> <p>QC/Leader: _____</p>

Instructions:

$x - y$ , /n basis of  $x, y \rightarrow x = 4.894$



$x$	$y$
0	11.9
1	-28.25
2	-18.1
3	562
4	-430.7
5	113.574
6	383.21

According to the text, the values are listed in 2004.

$y_0 = 10.$

$x_1 = -45.08..$

$x_2 = -26.43..$

$x_3 = -14.02..$

$x_4 = -5.80.$

$x_5 = -.47..$

GROUP NAME: IRISH MATH BOMBS

Logo:



Date: \_\_\_\_\_

Topics:

Student Names (First and Last)

Speaker/Presenter: Connor Krusman

Writer/Prep: Bobby O'Connor

QC/Leader: Boat Strap Bill Turner Smith

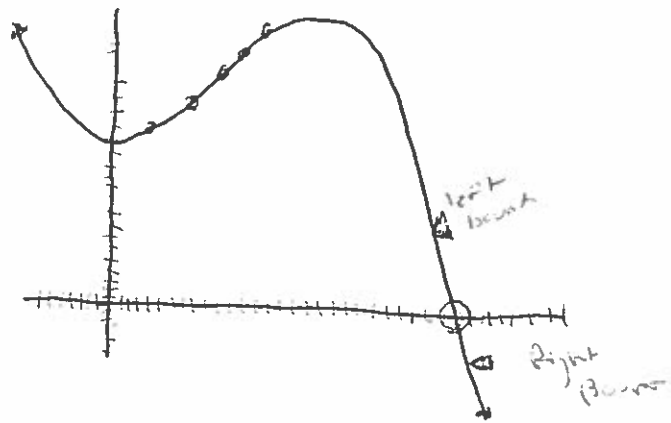
Instructions: Poop your pants then sit on a dryer set to "Heavy Load"

guess?

$x = 10 \xrightarrow{\text{stere}} x$

$x - y_i / \text{ndenis}(y_i, x, x) \Rightarrow x$  Enter x whatever  
 $x = 230x$

x	y
3	13
5	15
7	16
9	19
11	20



- 1) -2.93
- 2) 7.38
- 3) -9.41
- 4) -2.93
- 5) 7.38

**First 5**

$x = 230x$

~~\_\_\_\_\_~~ The sales of PBR will be zero in the year 2023

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

**Instructions:** APPLE STOCK PRICE

Year	Price
10	
11	
12	
13	

$$y_1 = -8.588833333333334x + 51793.40571433x - 10413$$

$$y_2 = 50.45040x + 697754.3$$

$y_2 = x^2 + 11x + 2$

- guesses
- 63: 2008.11
  - 64: 2005.3
  - 65: 2006.99

guess  
 $x = 10 \rightarrow x$

Our graph is at 2015  
 in January 2015 apple  
 stock price will be

<p>GROUP NAME: <u>Wolf Pack</u></p> <p>Logo: _____</p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>DC</u></p>
<p>Date: _____</p> <p>Topics: _____</p>	<p>Writer/Prep: <u>Jared S.</u></p> <p>QC/Leader: <u>Quay</u></p>

Instructions:

Guess of 50

68.27146851

80.09797174

87.55605152



96.28270821

Guess of 100

99.76857577

99.75550851



99.75546572

Guess of 1000

702.6046136

504.3766087

372.2786584



126.7724697

In 1996, 1999, 2026 the rate of internet speed reaches zero.

$$x - \frac{f(x)}{f'(x)}$$