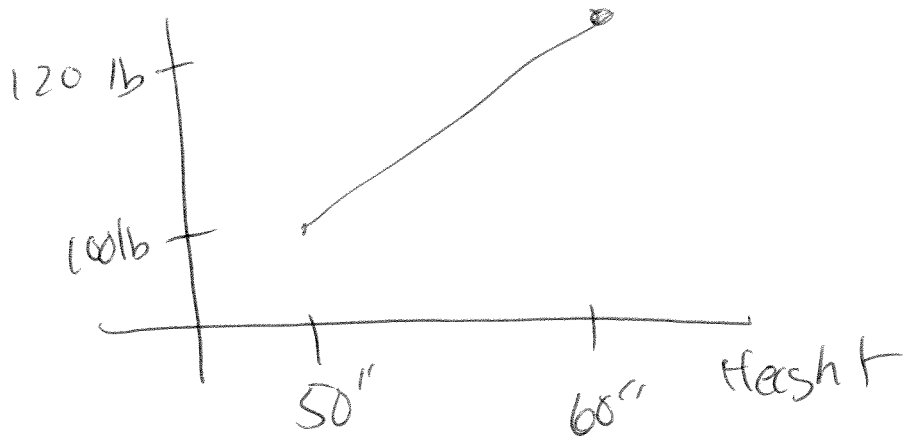
CALCULUS = study of Change (of Functions)

3 ways of change < Increase
Decrease
Constant.

2 types of change < Average (2 pts)
Instantaneous (1 pt)

Find Average Rate of Change.



$$\bar{m} = \frac{\Delta y}{\Delta x} = \frac{120 - 100}{60 - 50} = \frac{20}{10} = 2 \text{ lbs/in.}$$

Instantaneous Rate of Change

CALC = [2nd] [trace] 6: dy/dx

$x = 100 \quad dy/dx = -23.67\ldots$

AT 1 POINT

$f(x) = x^2 - 7$

Average Rate of change betwee 2 & 3

$f(3) = 9 - 7 = 2$

$f(2) = 4 - 7 = -3$

x	y
2	-3
3	2

$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{2 - -3}{3 - 2} = 1$

More general

$f(2+h) = (2+h)^2 - 7$

$f(2) = -3$

2	-3
2+h	$-3+4h+h$

$4 + 4h + h^2 - 7$

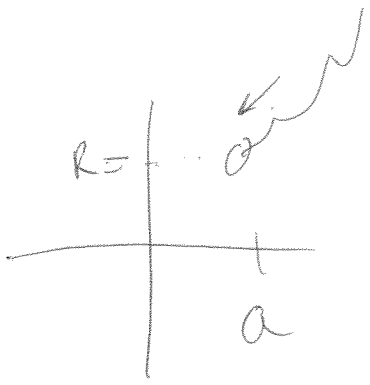
$m = \frac{\Delta y}{\Delta x} = \frac{4h + h^2}{h}$

$= \frac{h}{h}(4 + h)$

Two Sided Limits

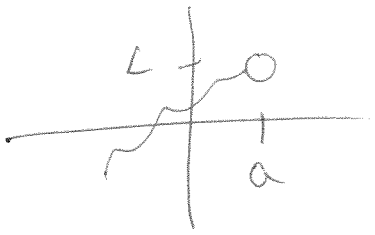
Right sided Limit

$$\lim_{x \to a^+} f(x) = R$$



Left sided Limit

$$\lim_{x \to a^-}$$



$$\lim_{x \to 150^+} r(x) = 2570.3$$

$$\lim_{x \to 150^-} r(x) = 3366.7$$

Given $f(x) = x^2$

Find $\dfrac{f(x+h) - f(x)}{h}$

Instantaneous Rate

Let "h" be 0

$$y = \frac{x^2 - 4}{x - 2} = x + 2$$

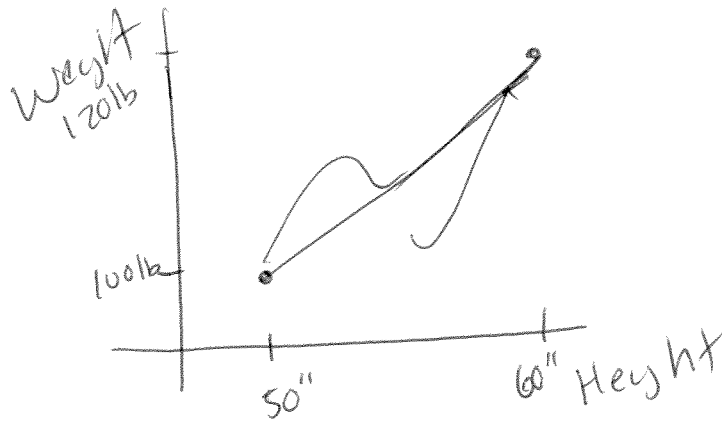
At $x = 2$ $y = 4$

$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2} = 4$$

$$\lim_{x \to 3} \frac{x^2 - 4}{x - 2} = \frac{3^2 - 4}{3 - 2} = 5$$

LIMIT

Average Rate of Change



$$\bar{m} = \frac{\Delta y}{\Delta x} = \frac{120-100}{60-50} = \frac{20}{10} = 20 \text{ lb/in}$$

50	5734.4
300	~~5734.4~~ 1050

$$= \frac{46}{-250}$$

STAT ▶ CALC 4: LinReg

Y= VARS 5: ▶ 1:

STAT ▶ CALC 5: QuadReg

Y= Y_2 VARS 5: ▶ ▶ 1:

split in middle. X = 150

Y_1 = LinReg /(X ≤ 150)

2nd math 6: ≤
4: ≥

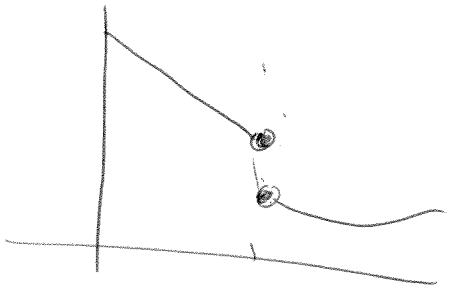
Y_2 = QuadReg /(X ≥ 150)

Evaluate at multiple values

Tblset = 2nd window

▼ ▼ ▶ Ask Enter

TABle = 2nd Graph



f(50) = 5734.4

f(100) = 4550.5

f(200) = 1050

f(150) = { 3366.7 or 2678.3 }

$f(x) = \begin{cases} \text{LinReg} & x \leq 150 \\ \text{quad} & x \geq 150 \end{cases}$

GROUP NAME: Mathletes	Student Names (First and Last)
Logo: 	Speaker/Presenter: Kyle Inverso
Date: 8/28/13	Writer/Prep: Aidan Callahan
Topics: rate of change	QC/Leader: Logan Hackenbury

Instructions:

X	Y
1927	100
2007	30

$m = \frac{\Delta y}{\Delta x} \quad \frac{100-30}{2007-1927} = \frac{7}{8}\ \frac{\text{grade}}{\text{year}} \quad .875\ \frac{\text{grade}}{\text{year}}$

In 1957, the instantaneous rate of change was

$-.0092\ \frac{\text{grade}}{\text{year}}$

x	y
1927	100
1937	92
1947	85
1957	72
1967	62
1977	51
1987	42
1997	37
2007	30

GROUP NAME: The Wolfpack Logo:	Student Names (First and Last) Speaker/Presenter: Jared S.
Date: 8/12/13 Topics: Limits	Writer/Prep: Dominic Gomez (DC) QC/Leader: Quayshawn J.

Instructions:

YEAR	SPEED
1996	14k
1998	28k
2001	56k
2003	5m
2006	10m

$$m = \frac{\Delta y}{\Delta x} = \frac{10000 - 14}{2006 - 1996}$$

$$= \frac{9986}{10}$$

$$m = 998.6 \text{ kb/year}$$

$x = 2004 \quad dy/dx = 4248.7071 \text{ kb/year}$

$x = 2000 \quad dy/dx =$

GROUP NAME: Irish Math Bombs

Logo:

Date: 8/28/13

Topics:

Student Names (First and Last)

Speaker/Presenter: Bobby O'Connor

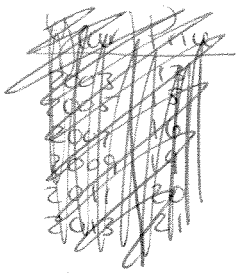
Writer/Prep: Connor Krugman

QC/Leader: Willian Smith

Instructions:

Average Rate of Change

PBR Price over the last 10 years



ARC: $\frac{\Delta y}{\Delta x}$

Ask calc $\frac{\Delta y}{\Delta x}$

x	y
3	13.05
13	20.98

year 2000's x	Price y
3	13
5	15
7	16
9	19
11	20
13	21

$\frac{7.93}{10} = .793$ dollars per year

79¢ raise per year

Calculating Instantaneous Rate of Change

in 2005, the r.o.c was

.836

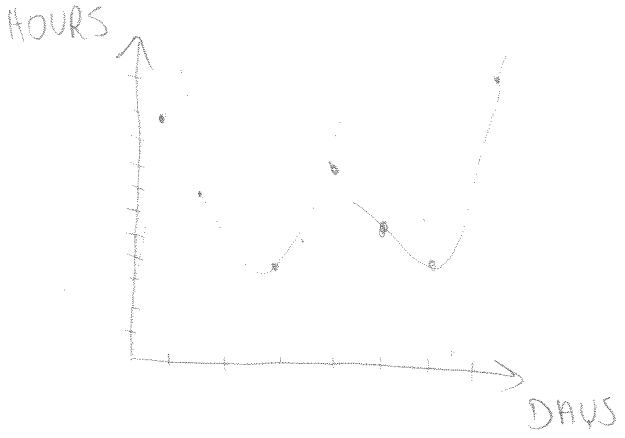
84¢ per year

GROUP NAME: Apples 2 Apples Logo:	Student Names (First and Last) Speaker/Presenter: Thomas Y
Date: 08/28/13 Topics:	Writer/Prep: ANNA S QC/Leader: Steve H

Instructions:

Avarage Rate of Change

DAY	HOURS
Sunday	10
Monday	7
Tuesday	4
Wednesday	9
Thursday	6.5
Friday	4.5
Saturday	11



SIN reg for $x \leq 4$
quartreg for $x \geq 4$

Avarage Rate of Change

$$\bar{m} = \frac{\Delta y}{\Delta x} = \frac{11-10}{7} = \frac{1}{7}$$

Instantaneous Rate of Change:

On Monday $\frac{dy}{dx} = -7.36$ hours/day

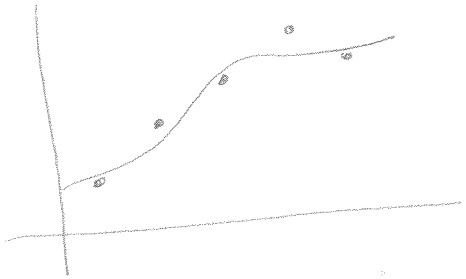
GROUP NAME: CCS Logo:	Student Names (First and Last) Speaker/Presenter: corneal abugrass
Date: 08/28/13 Topics:	Writer/Prep: Courtney Grubb QC/Leader: Stephen Smith

Instructions: average rate of change
apple stock prices over the last 5 yrs.

Data:

YRS.	Stock Price
'09	$211.98
'10	$336.12
'11	$405.00
'12	$532.17
'13	$501.02

graph



$$\frac{\Delta y}{\Delta x} = \frac{433.3 - 492.69}{-1} = \frac{-59.4}{-1} = 59.4$$

59.4 stock price/yr

In 2010 the instantaneous rate of change was 117 $ per year

GROUP NAME: The factors Logo:	Student Names (First and Last) Speaker/Presenter: Ryan Bigley
Date: 4/29 Topics:	Writer/Prep: Kevin Chavez QC/Leader:

Instructions: Average rate of change
instintanius rat of chage

y	x
1950	3.5
1960	2.2
1970	1.65
1980	2.5
1990	6.7
2000	9.2

$m = \frac{\Delta y}{\Delta x} = \frac{2000 - 1950}{9.2 - 3.5} = \frac{50 \text{ years}}{5.7 \text{ billions}}$

1,140,000,000 Dollars per year

in 1965 the instintanious rate of change was 1.2 million dollars

in 1980 the instintanious rate of change in was 2.1 million dollars

GROUP NAME: Time is Money.	Student Names (First and Last)
Logo:	Speaker/Presenter: Angelika Mrowiec
Date: 02/28/13	Writer/Prep: Shivam Singh
Topics:	QC/Leader: Eugenio Pelaez

Instructions:

Price of Iphone 4S changes.

L_1	L_2
0	700
1	600
2	350
3	200
4	650
5	250

STAT 1: EDIT

STAT ⟩ CALC 4: LIN Reg.
<enter>

Y= VARS 5: ⟩ ⟩ <enter>

STAT ⟩ CALC 5: QUAD Reg.
<enter>

Y_2= VARS 5: ⟩ ⟩ <enter>

SPLIT

Y= Bottom of Linear /($x \leq 3.5$)

Y_2= Bottom of QUAD /($x \geq 3.5$)

Average change.

0 619.05

5 375

$\frac{\Delta Y}{\Delta x} = \frac{375 - 619.05}{5 - 0}$

$= -48.81$ ~~time~~ $.

$ per year

Instantaneous Rate of Change

CALC = 2nd TRACE 6: dy/dx

$x = 2.5$

$dy/dx = (-64.28571)$

In 2.5 Years price decreases by $\$-64.28571$.

P.V. Yes

GROUP NAME: The Scientists

Logo:

Date: 8/28/13

Topics: The number of extinct species

Student Names (First and Last)

Speaker/Presenter: Dorin Ciorotisan

Writer/Prep: Nicole Pownall

QC/Leader: Kiersten Hendrickson

Instructions:

L_1	L_2
2008	750
2009	836
2010	844
2011	870
2012	876
2013	908

$$\frac{\Delta y}{\Delta x} = \frac{2013 - 2008}{908 - 750} = \frac{158}{5} = 31.6 \text{ species/yr}$$

AT year 2010 the instantaneous Rate is

$dy/dx = 14.4$ species/yr