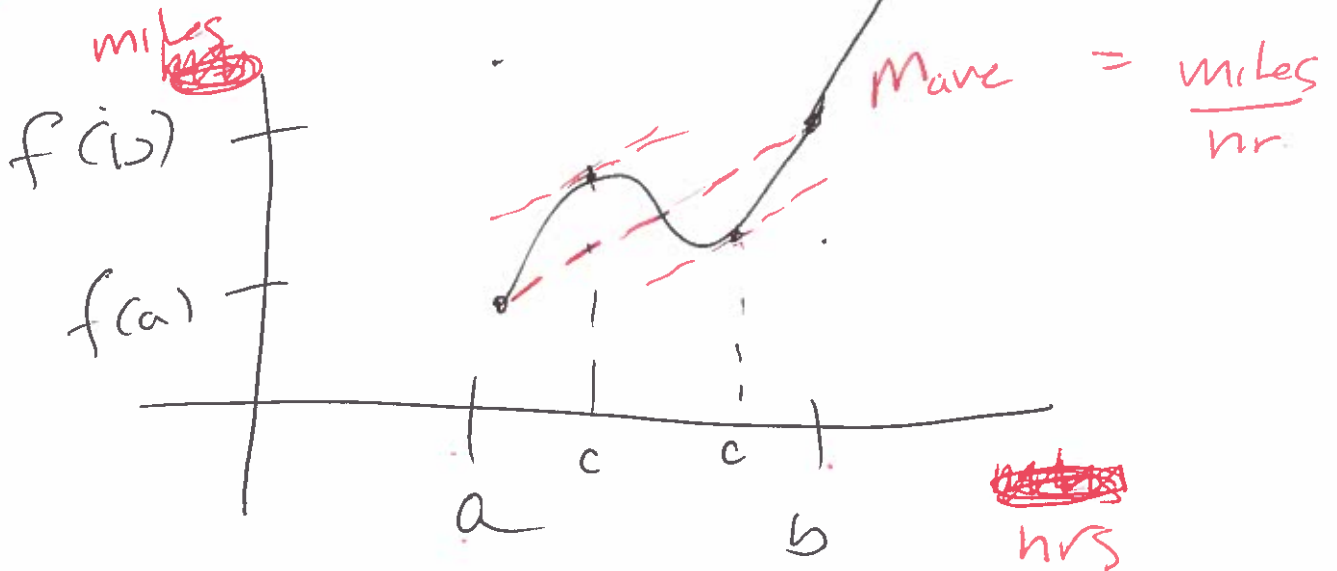


# Mean Value Theorem (MVT)

(Average) Rate of Change

$$M_{ave} = \frac{f(a) - f(b)}{a - b}$$

has to be continuous.



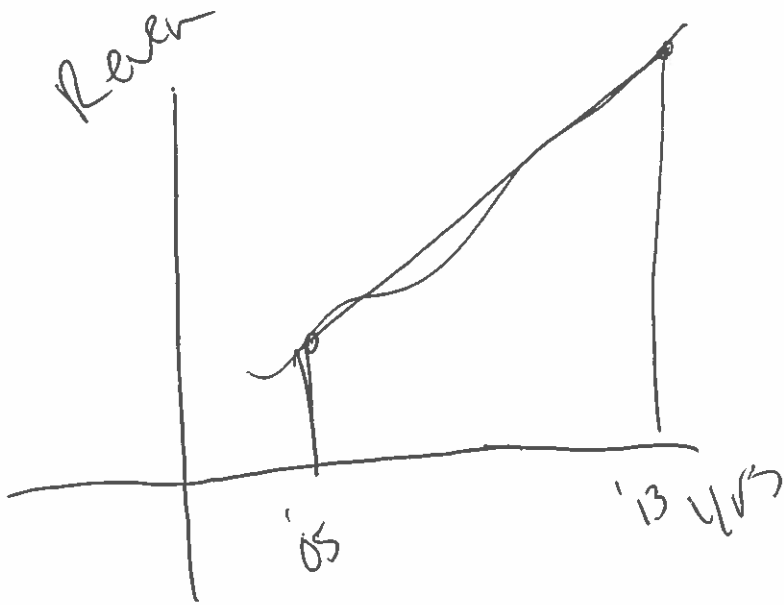
$$58.8 = \frac{1000 \text{ miles}}{\text{mph} \cdot 17 \text{ hrs}} =$$

MVT says there is a fine (x-value) on  $[a, b]$  when

$$M_{ave} = \frac{f(a) - f(b)}{a - b} = M_{\text{instantaneous}} (x=c)$$

$$\frac{f(a) - f(b)}{a - b} = f'(c)$$

$$a \leq c \leq b$$



X	Y <sub>1</sub>
05	13.087...
13	20.944...

Ave Rate:  $\frac{20 - 10}{13 - 5} = \frac{10}{8} \text{ \$/yr}$

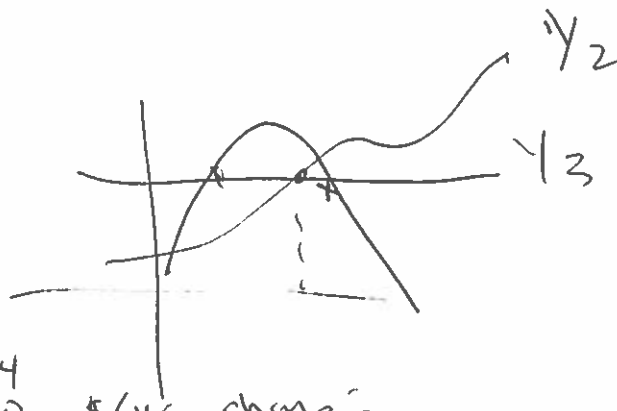
$$\frac{Y_1(13) - Y_1(5)}{13 - 5} = \frac{7.856...}{8}$$

$Y_1 \neq$

$Y_2 \equiv \text{Intersect}(Y_1, X, X)$

$Y_3 \equiv 10.118, 7896$

Intersection method



In Jun 2004  
 Feb 2010  
 same as average between 2003 & 2013

Calc 5: Intersect  
 Center } 403  
 $X = 10.11$   
 $X = 4.05$

# Logarithmic Differentiation

P104 4  
Defin

$$y = B^x$$

$$x = \log_B y$$

$$\log_B A^x = x \log_B A$$

Ladder

Log of both side

P5

Ex  $y = (2x-3)^{(4x+8)}$

$f(x)$   $g(x)$

P5

$$\ln y = \ln (2x-3)^{4x+8}$$

P3

$$\ln y = (4x+8) \ln (2x-3)$$

Implicit Differentiation

$$\frac{d}{dx} \ln y = \frac{d}{dx} (4x+8) \ln (2x-3)$$
$$\frac{1}{y} \cdot \frac{dy}{dx} = (4x+8) \frac{d}{dx} \ln (2x-3) + \frac{d}{dx} (4x+8) \cdot \ln (2x-3)$$

$$\frac{1}{y} \frac{dy}{dx} = (4x+8) \frac{1}{2x-3} \cdot \frac{d}{dx}(2x-3) + 4 \ln(2x-3)$$

$$\frac{1}{y} \frac{dy}{dx} = \left[ \frac{4x+8}{2x-3} \cdot (2) + 4 \ln(2x-3) \right]$$

$$\frac{dy}{dx} = y \left[ \frac{8x+16}{2x-3} + 4 \ln(2x-3) \right]$$

$$\frac{dy}{dx} = (2x-3)^{4x+8} \left[ \frac{8x+16}{2x-3} + 4 \ln(2x-3) \right]$$

Ex  $(\cos x)^x$

$$x^x$$

$$x^x \left[ x \ln x + 1 \right]$$

Product Rule

<p><b>GROUP NAME:</b> <i>1 - notes</i></p> <p><b>Logo:</b> <i>—</i></p>	<p><b>Student Names (First and Last)</b></p> <p><b>Speaker/Presenter:</b> _____</p>
<p><b>Date:</b> <i>12/11/11</i></p> <p><b>Topics:</b> <i>Notes</i></p>	<p><b>Writer/Prep:</b> _____</p> <p><b>QC/Leader:</b> _____</p>

**Instructions:**

*Handwritten notes and diagrams:*

*Diagrams showing points and lines:*

- Point A*
- Point B*
- Point C*
- Point D*
- Point E*
- Point F*
- Point G*
- Point H*
- Point I*
- Point J*
- Point K*
- Point L*
- Point M*
- Point N*
- Point O*
- Point P*
- Point Q*
- Point R*
- Point S*
- Point T*
- Point U*
- Point V*
- Point W*
- Point X*
- Point Y*
- Point Z*

*Other notes:*

- Intersect*
- (3, 5) / (-2, 2)*
- is*
- at*

GROUP NAME: Time Is Money



Logo:

Student Names (First and Last)

Speaker/Presenter: Angelika Mazurek

Writer/Prep: Shviam Singh (Shiv)

QC/Leader: Eugenio Pelaez

Date: 10/7/13

Topics:

Instructions:

IPIC: 48 sat 11

total A

1100

1100 = 1000 + 100

1000 = 1000

3.1 = 0.5

X	y
1	2.1
2	3.8
3	2.9
4	6.7
5	3.5
6	2.2

1100 = 1000 + 100  
 = 1000 + 100  
 = 1100

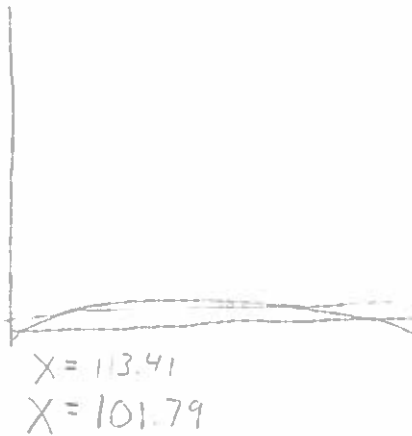
1.20 = 1.10 + 0.10  
 1.10 = 1.00 + 0.10  
 1.00 = 1.00

<b>GROUP NAME:</b> <u>Wolf Pack</u> <b>Logo:</b> _____ <b>Date:</b> _____ <b>Topics:</b> _____	<b>Student Names (First and Last)</b> <b>Speaker/Presenter:</b> <u>Ally</u> <b>Writer/Prep:</b> <u>Jared</u> <b>QC/Leader:</b> <u>DC</u>
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**Instructions:**

Cubic

X	Y <sub>2</sub>
16	-1009
98	15429
101	18941
103	17397
107	21803
109	21953
113	15372



In September 2001 and May 2013 the speed of the internet was the same as the average rate of change between 2013 and 1996.

$$Y_1(113) - Y_1(16)$$

$$= 24280.89573$$

$$113 - 96 = 17$$

$$\frac{24280.89573}{17}$$


$$= 1428.287943 \text{ kb}$$

<b>GROUP NAME:</b> <u>The Scientists</u>	<b>Student Names (First and Last)</b>
<b>Logo:</b>	<b>Speaker/Presenter:</b> <u>Daniel Cross</u>
<b>Date:</b> _____	<b>Writer/Prep:</b> _____
<b>Topics:</b>	<b>QC/Leader:</b> <u>Nicole P.</u>

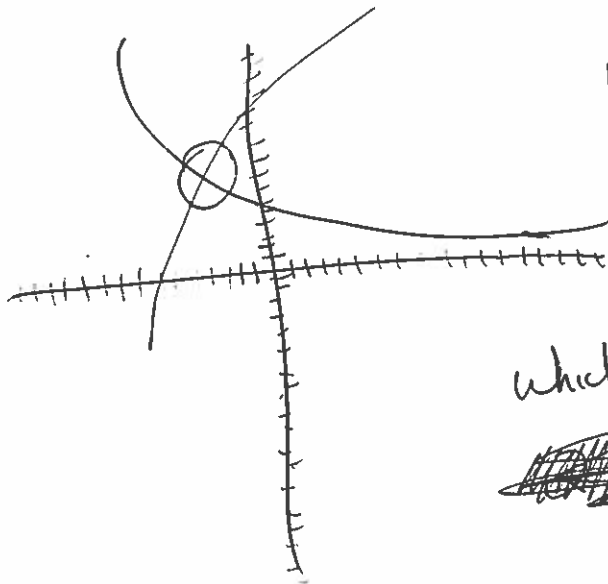
**Instructions:**

*[Faint handwritten notes and calculations are visible in this section, including the numbers 9.1 and 12.5.]*



<p>GROUP NAME: IRISH MATH BomBS</p> <p>Logo: </p>	<p>Student Names (First and Last)</p> <p>Speaker/Presenter: Connor Krutsmann</p>
<p>Date: _____</p> <p>Topics: _____</p>	<p>Writer/Prep: Robby O'Connor</p> <p>QC/Leader: Bill Gates</p>


Instructions:



intersection at  
 $(-2.09, 3.61)$

which means ...  
~~\_\_\_\_\_~~ in 1998

The average rate of change  
 is \$3.61 of sale price  
 of PBR

<b>GROUP NAME:</b> Logo: 	<b>Student Names (First and Last)</b> Speaker/Presenter: _____ Writer/Prep: _____ QC/Leader: _____
<b>Date:</b> _____ <b>Topics:</b>	

**Instructions:** *Handwritten notes and scribbles*

*Handwritten notes and calculations:*

$x + 7 = 30$

$2011$

$72.26$

In 2011 the average rate of change was 72.26

<b>GROUP NAME:</b>	<b>Student Names (First and Last)</b>
<b>Logo:</b>	<b>Speaker/Presenter:</b> <u>Edmund S. ...</u>
<b>Date:</b> <u>...</u>	<b>Writer/Prep:</b> <u>...</u>
<b>Topics:</b>	<b>QC/Leader:</b> <u>...</u>

**Instructions:**

*[Faint handwritten notes and diagrams, possibly related to a presentation or project. Some legible words include "Presentation" and "Section".]*

<b>GROUP NAME:</b>  <b>Logo:</b>	<b>Student Names (First and Last)</b>  <b>Speaker/Presenter:</b> _____
<b>Date:</b> _____  <b>Topics:</b>	<b>Writer/Prep:</b> _____  <b>QC/Leader:</b> _____
<b>Instructions:</b>	