MAT 151 Calculus 1

Prof. Porter

Day 2

Agenda

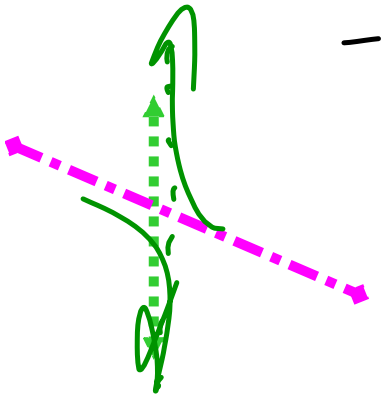
Homework Review

Lecture on Limits

Group Work

ALEKS Homework

Slant Asymptote



$$-2x-4 \;\overline{)\; x^2+2x-6}$$

$$-\left(x^2+2x\right)$$

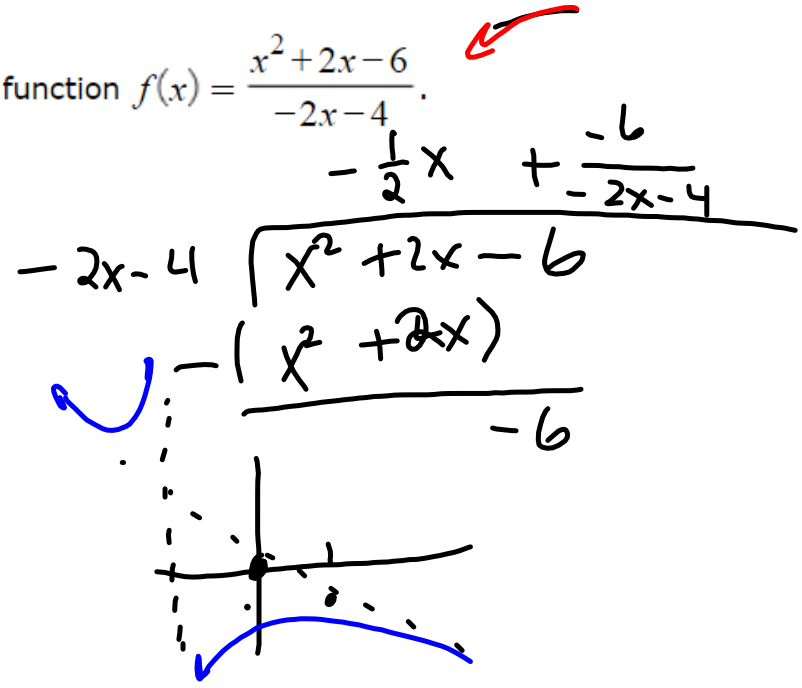
$$-6$$

$$-\frac{1}{2}x \quad + \frac{-6}{-2x-4}$$

$$y = -\frac{1}{2}x \quad \text{Slant}$$

Sketching the graph of a rational function: Quadratic over linear

Graph the rational function $f(x)=\frac{x^2+2x-6}{-2x-4}$.



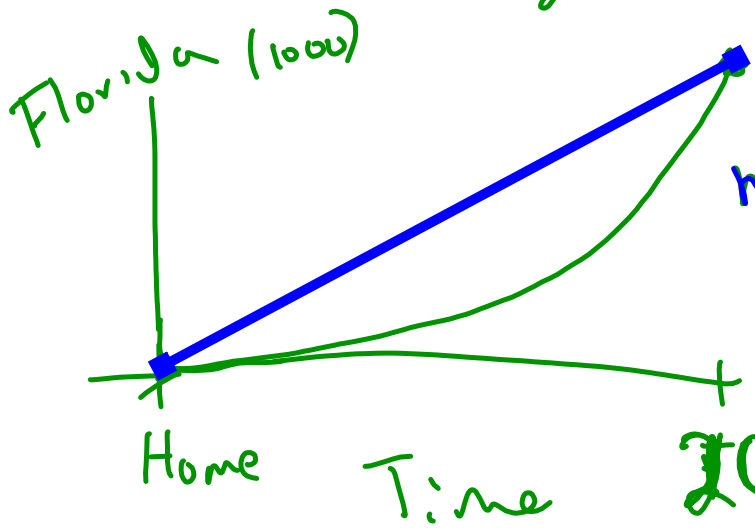
Lecture:Limits

Math = ?

Calculus =?

Math = Language

Calc = Study of Change

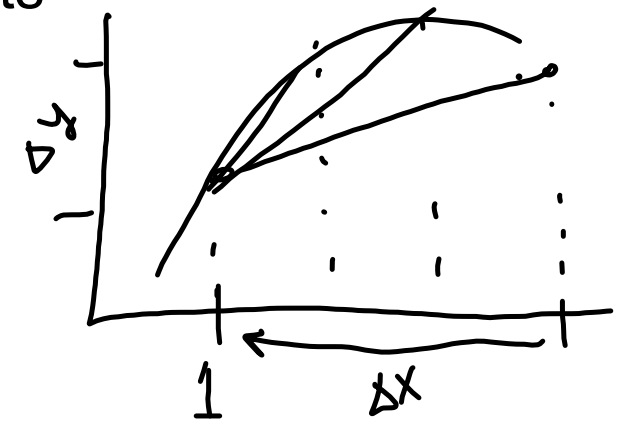


$m = \frac{1000\text{ mi}}{20\text{ h}}$

$= 50$ mph

A.R.C

Limits



$\frac{\Delta y}{\Delta x}$ ← want $\Delta x = 0$

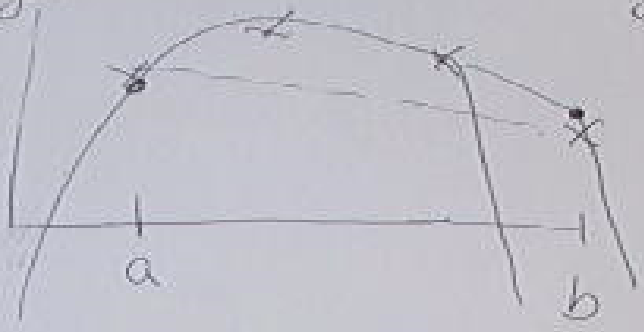
$\Delta x = 0$

Divide by zero.

Invent

Limits

Average Rates of Change

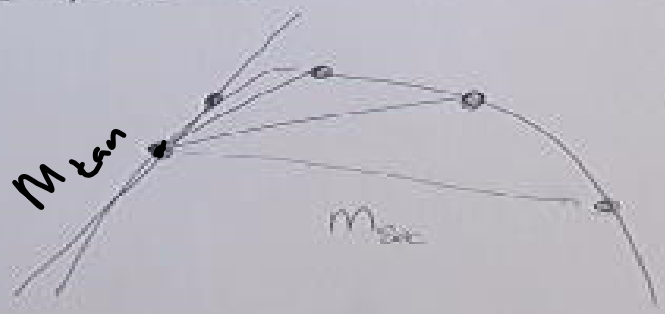


2 Points

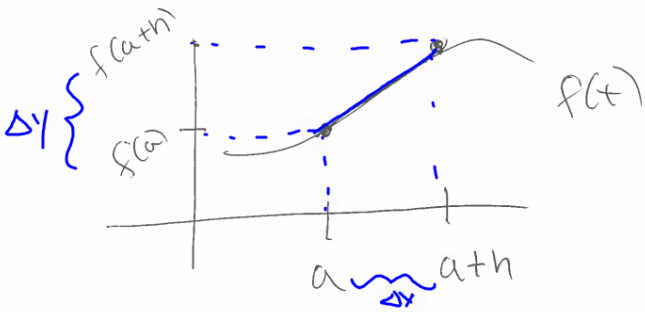
$$m = \frac{Y_1(b) - Y_1(a)}{b - a} \qquad \frac{\Delta y}{\Delta x}$$

One Point

Instantaneous Rate of Change
(speed at a moment one point)



M_{sec} = slope of secant



$$m_{sec} = \frac{f(a+h) - f(a)}{a+h-a} =$$

$$= \frac{f(a+h) - f(a)}{h}$$

Instantaneous

$$m_{tan} = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

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

$\frac{f(a+h) - f(a)}{h}$

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

$= 3a^2 + 6ah + 3h^2 - 7a - 7h + 5$

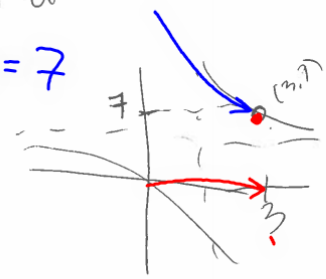
$f(a) = 3a^2 \quad -7a \quad +5$

$\frac{6ah + 3h^2 - 7h}{h}$

$\stackrel{?}{=} 6a + 3h - 7$

Hole in a Function

$\lim_{x \to 3} f(x) = 7$



$f(x) = \frac{g(x-3)}{h(x-3)}$

(3,7)

$f(3) = (\text{WI})$

"limit" $\rightarrow \lim_{x \to 3} \frac{x-3}{x-3} = 1$

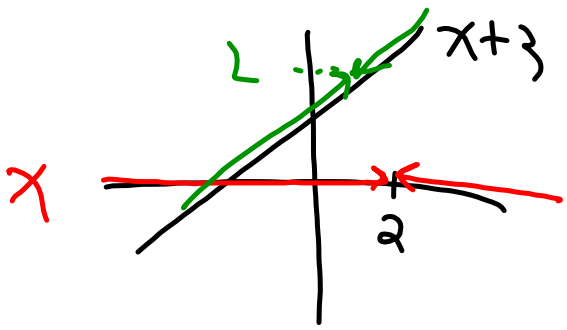
"limit as x goes to 3"

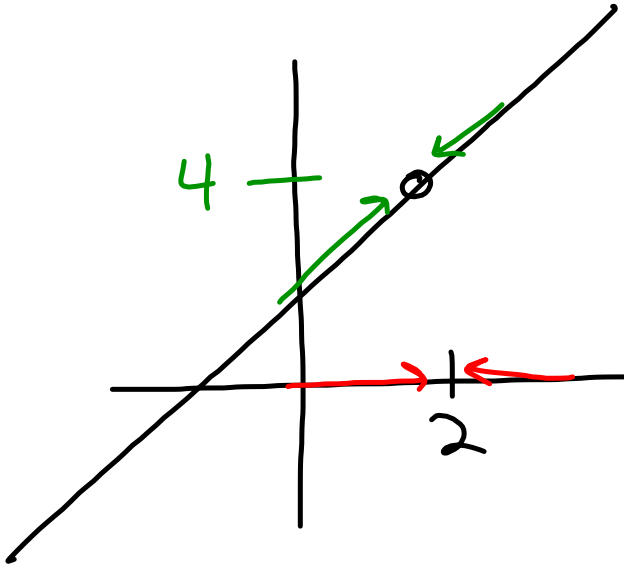
Notation

$$\lim_{x \to a} f(x) = L$$

limit as x goes to a of $f(x)$ is L

$$\lim_{x \to 2} x+3 = 5 = L$$



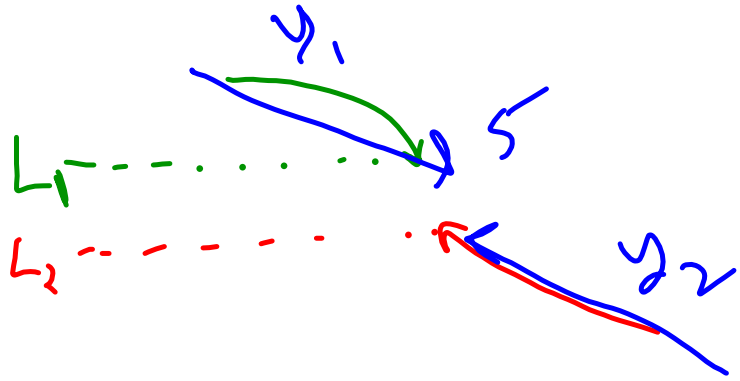


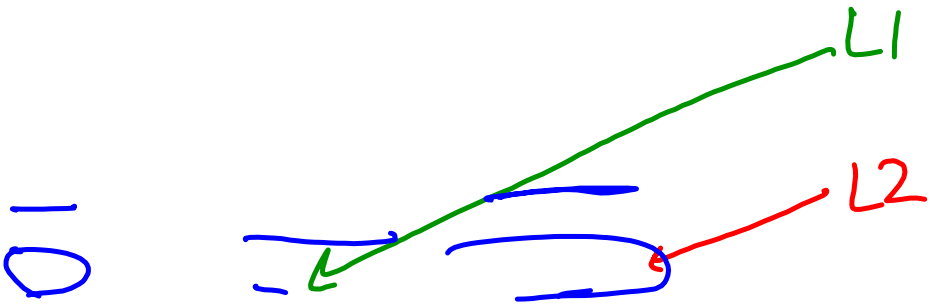
$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2} = 4$$

One sided Notation

$\lim_{x \to 40^-} f(x) = L_1$ Left

$\lim_{x \to 40^+} f(x) = L_2$ right





Calculator

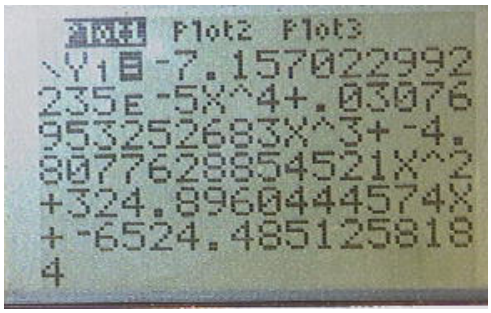
Do a regression

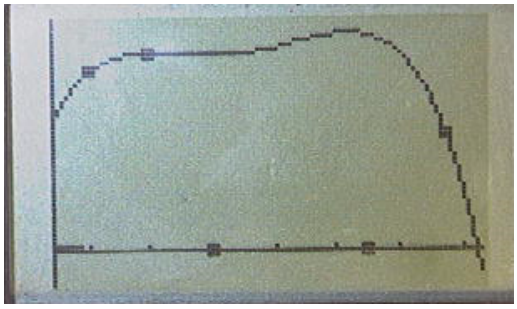
Quartic

STAT EDIT

Graph

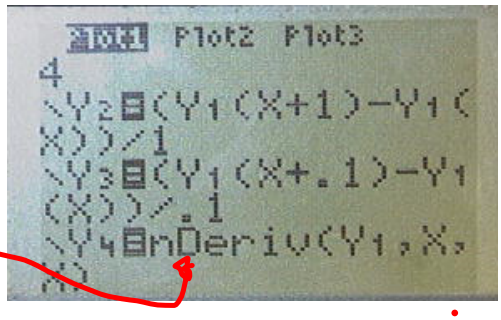
STAT ➔ CALC





VARS 5 > > 1

Enter more functions



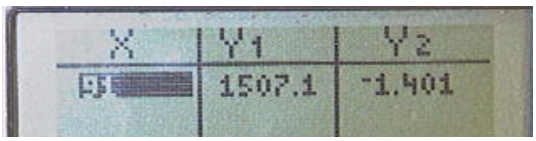
math 8: nderiv

TBLSET=

2nd Window

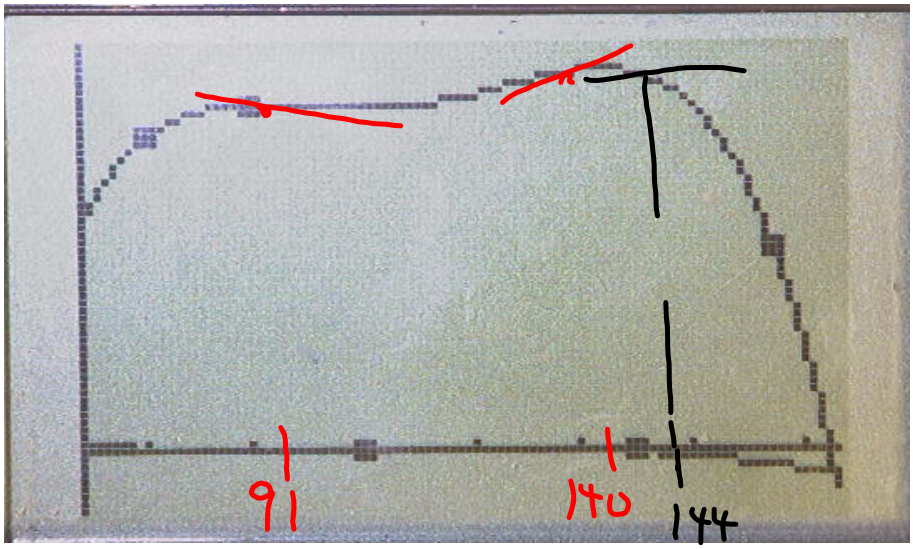
TABLE=

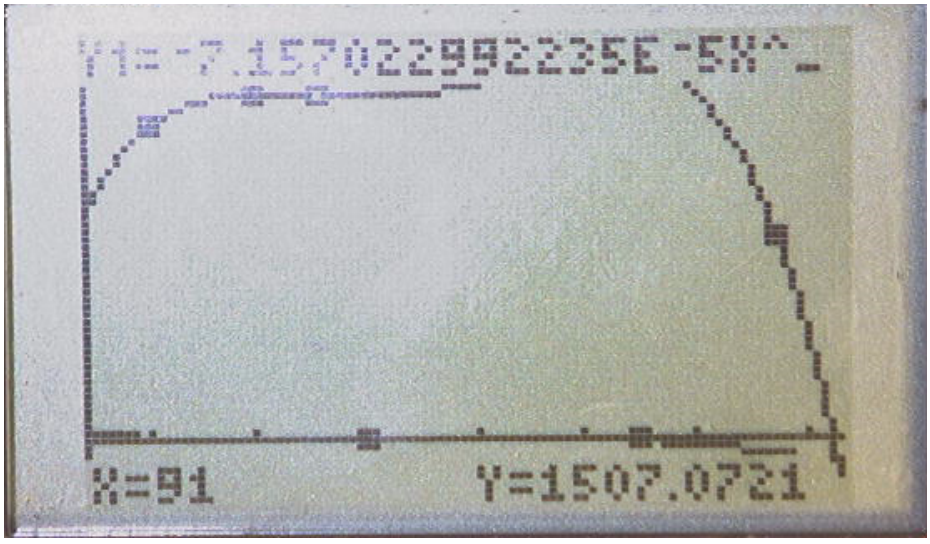
2nd Graph



pluged in 91

at $91 the revenue is 1507 but is decreasing by $1.40 per dollar



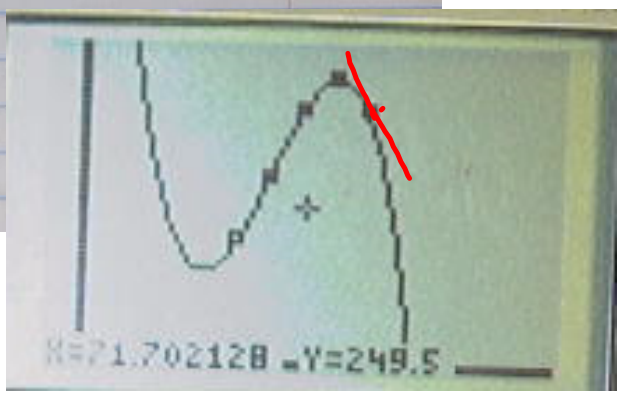


X	Y3	Y4
91	-1.439	-1.442
140	2.3859	2.4161
143.44	-.0388	[illegible]

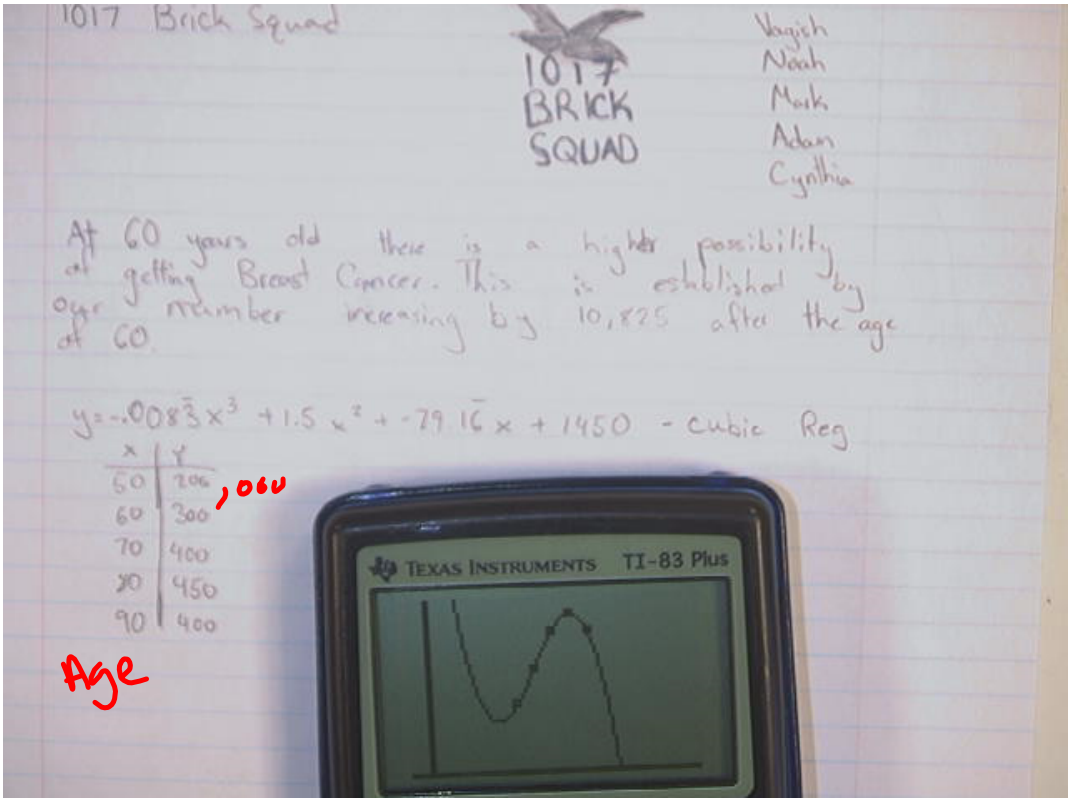
From the age of 90 to 91 the rate of breast cancer is decreasing by 11.6 thousand people

1017 Brick Squad / The Struggle

Ages of people	population by 10,000 who have BC
50	200
60	300
70	400
80	450
90	400



X	Y2	Y3
90	-12.42	



Rates

in world 7. Billion

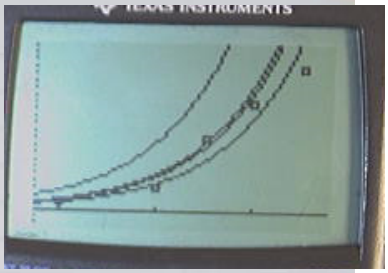
10,000 / yr of age

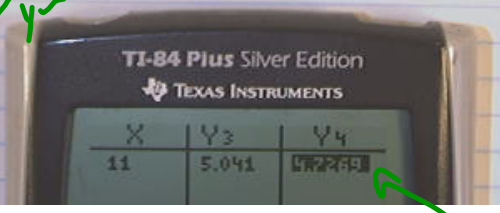
APPS

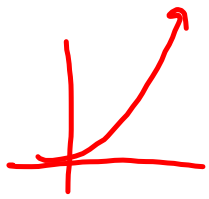
YEAR	DOWNLOADS
10	1
11	3
11.5	10
12	15
12.5	20

→ Exponential Reg

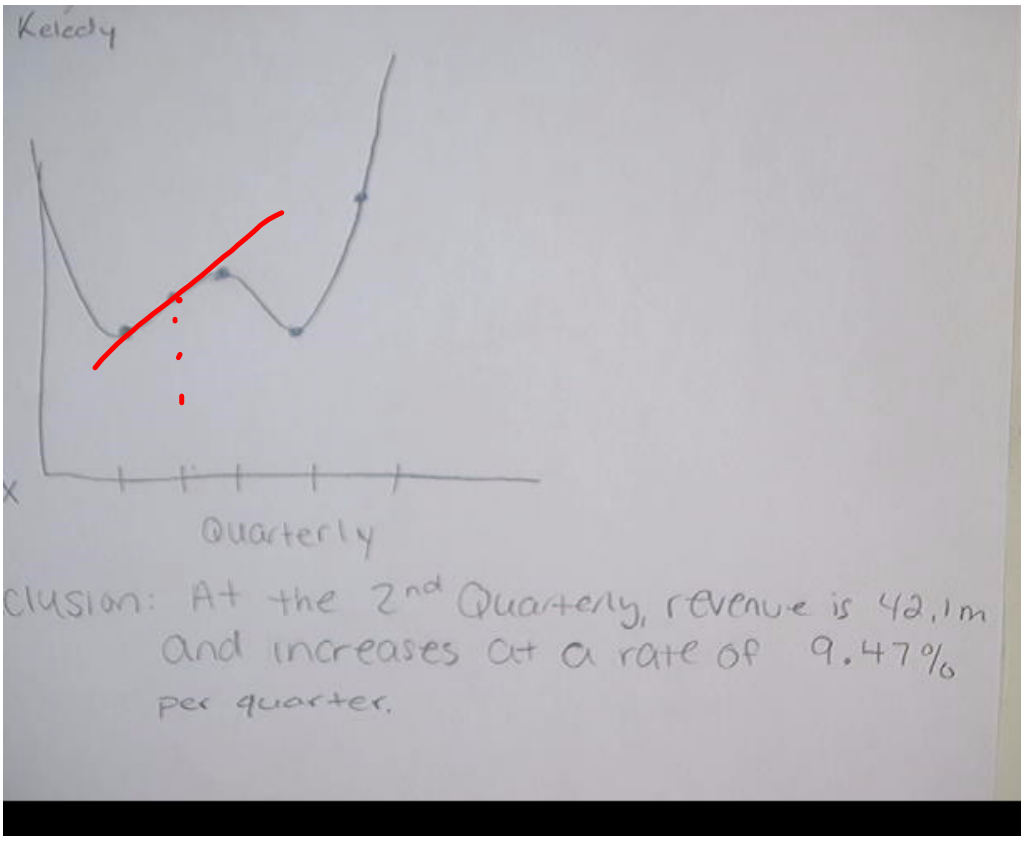
Statement: In the year 2011 there ~~was~~ were 3.7125 billion downloads and later increasing by 4.72698 /yr

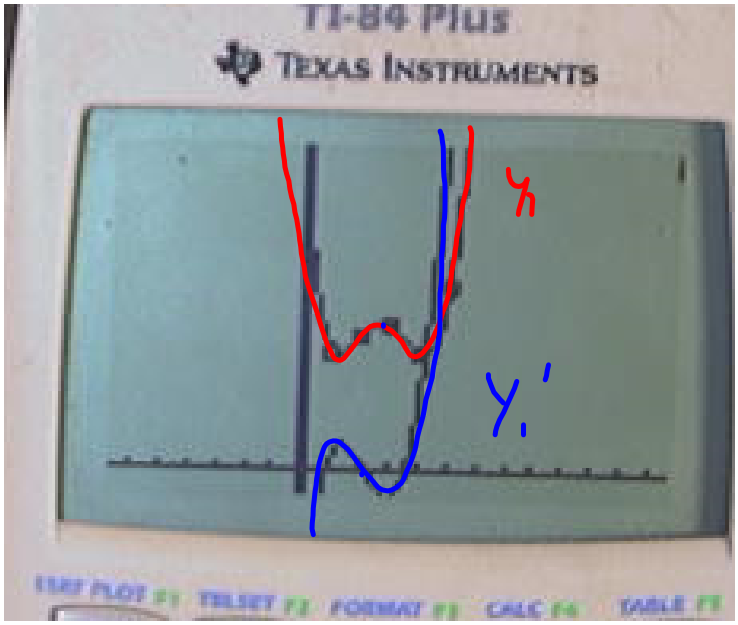




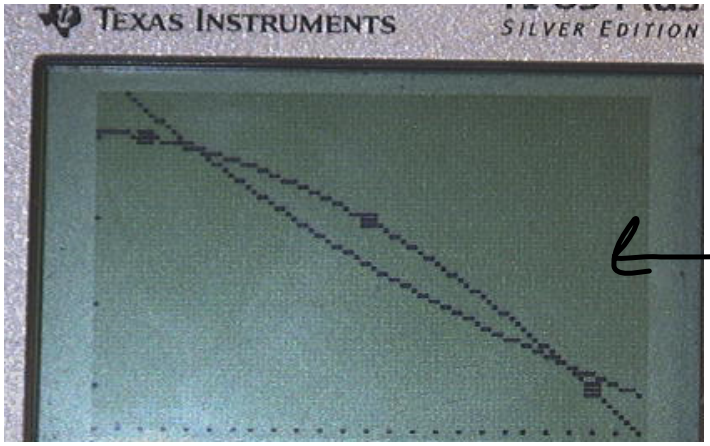


In 2011 about 5 B/yr

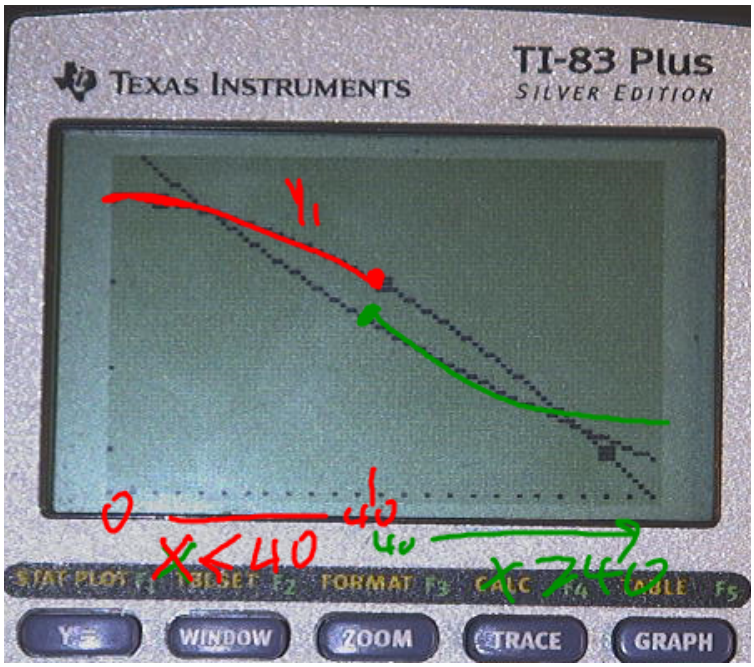

Kelcdy
X
Quarterly
clusion: At the 2nd Quarterly, revenue is 42.1m
and increases at a rate of 9.47%
per quarter.

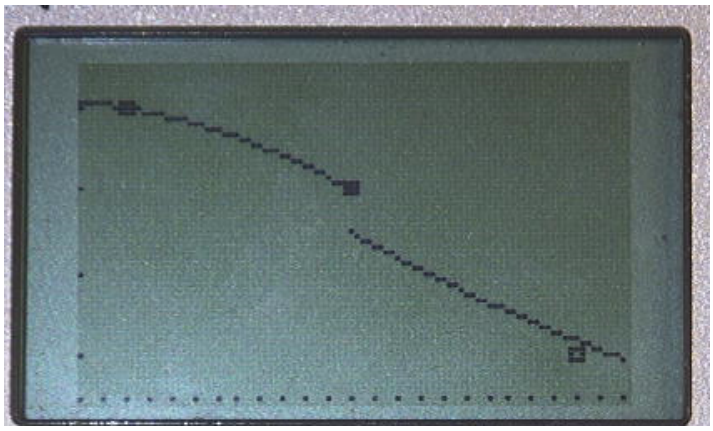

TI-84 Plus
TEXAS INSTRUMENTS
Y1
Y1'

Calculator - Split regression

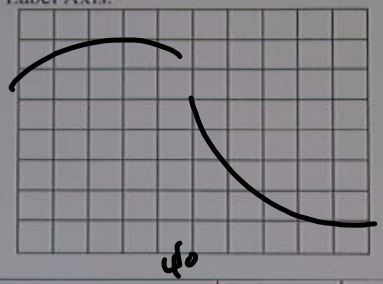


Two different regressions Y_1, Y_2

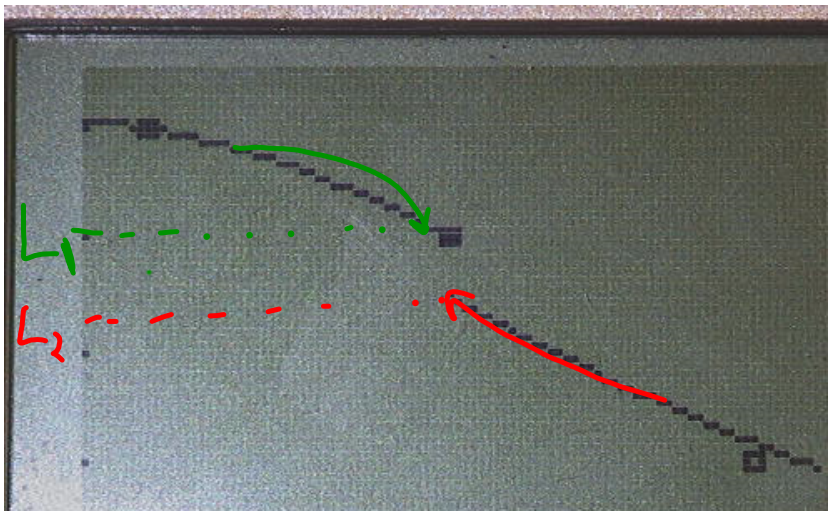

TEXAS INSTRUMENTS
TI-83 Plus
SILVER EDITION
Y1
0
40
40
X<40
X≥40
STAT PLOT F1
TBLSET F2
FORMAT F3
CALC F4
TABLE F5
Y=
WINDOW
ZOOM
TRACE
GRAPH



2. Roughly split the graph into two regions and perform different regressions on each side.
Plot data and regressions. Label Axis.



left regression split at a Y1=vars 5: > > 1: RegEq /(x≤a) right regression Y2=vars 5: > > 1: RegEq /(x≥a)	Left Regression used: Right Regression used: Location of split (a)	Quad Exp 40
Find Y1(a) Y2(a)	$\lim_{x \to a^-} r(x)$ $\lim_{x \to a^+} r(x)$	



$$\lim_{x \to 40^-} f(x) = L_1$$

$$\lim_{x \to 40^+} f(x) = L_2$$

X	Y1	Y2
39	5.145	ERROR
41	ERROR	4.3288
40	5	4.4814

L1

L2

left regression split at a Y1=vars 5: > > 1: RegEq /(x≤a) right regression Y2=vars 5: > > 1: RegEq /(x≥a)	Left Regression used:	QUAD
	Right Regression used:	EXP
	Location of split (a)	40
Y1(a) Y2(a)	$\lim_{x \to a^-} r(x)$	5
	$\lim_{x \to a^+} r(x)$	4.48

X	Y
Price	Sales

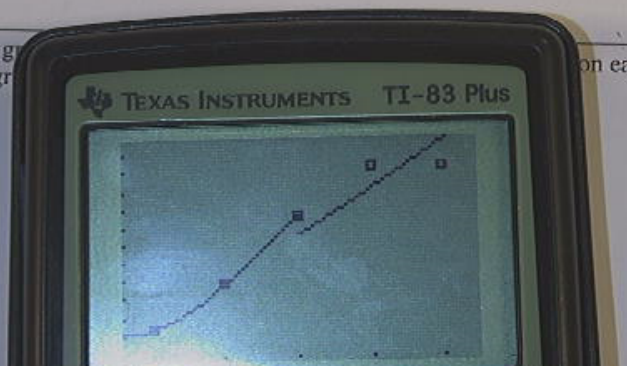
As I raise the price to $40
I expect to sell 5 cakes.
As I lower the price to $40
I expect to sell 4.48 cakes

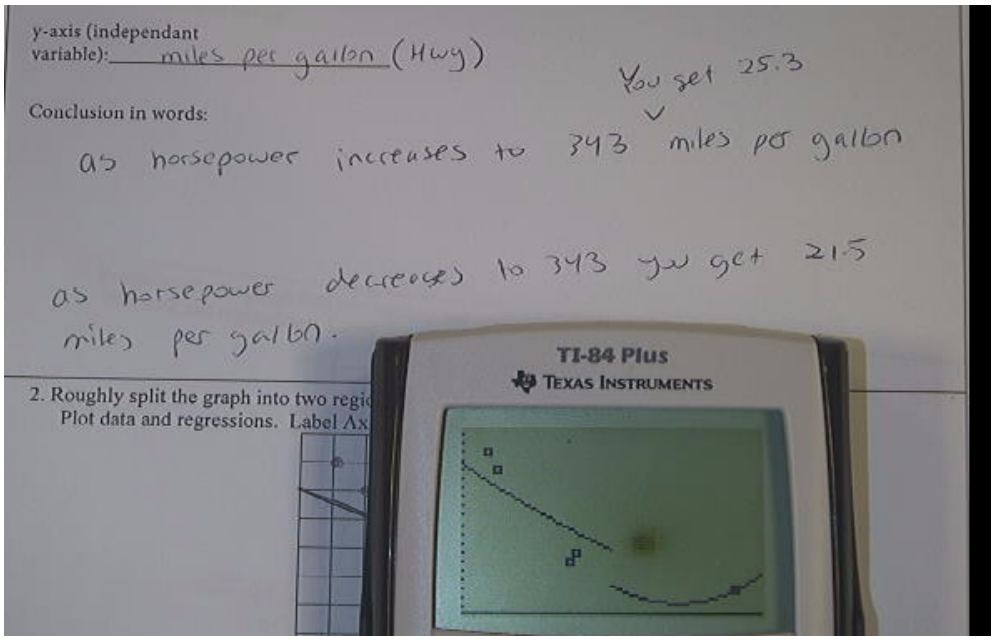
onclusion in words:

If I look forward to 2009, I expect 43.54 million people to be in poverty in the U.S

If I look back to 2009, I expect 42.487 million people to be in poverty in the U.S.

Roughly split the g
Plot data and regr
on each side.



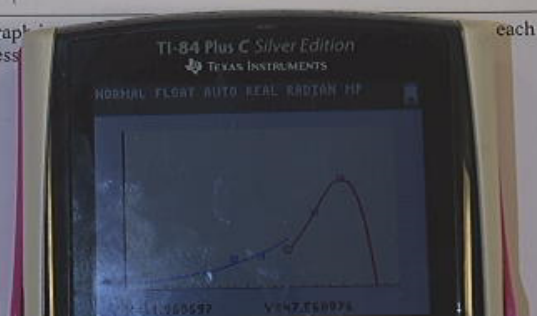

y-axis (independant variable): miles per gallon (Hwy)
You set 25.3
Conclusion in words:
as horsepower increases to 343 miles per gallon
as horsepower decreases to 343 you get 21.5 miles per gallon.
2. Roughly split the graph into two regi
Plot data and regressions. Label Ax
TI-84 Plus
Texas Instruments

If we look forward to 2012 we expect the salary to increase to $61.3 thousands/yr

As we look back to 2012 we expect the salary to decrease to $47.4 thousand/yr

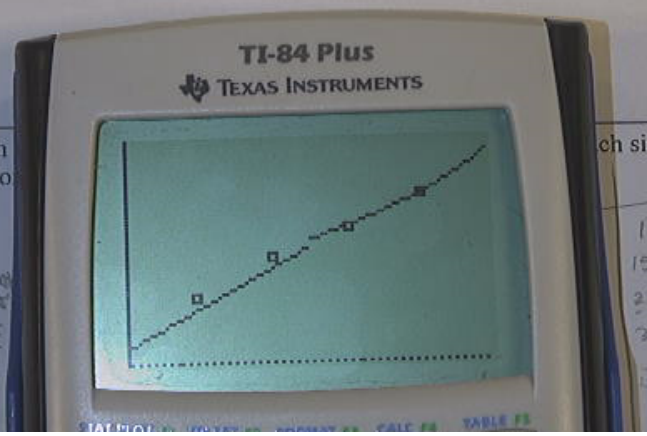
2. Roughly split the graph
Plot data and regress

each side.



Conclusion in words:

The waste in kg of e-waste increased drastically over years and began to go down as technology equipment becomes weight and smaller. Expected around 2050 the waste would be 165834 kg.



2. Roughly split the graph ch side.
Plot data and regressio

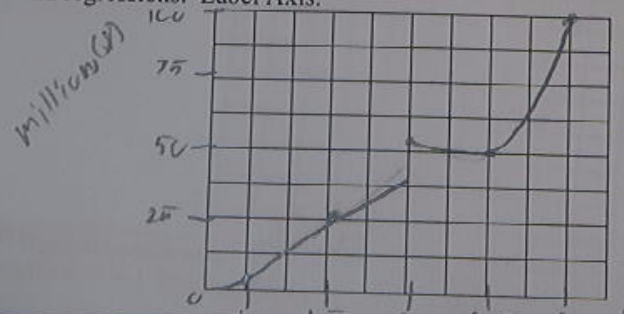
L2
1000
15978
25622
32589
39987

Waste in kg

on in words: As we go back in time, after 2 years of revenue we would think that the revenue would be 642.714 millions

As we look back at the revenue, we would see the revenue from used runtime to increase at a rapid rate.

ly split the graph into two regions and perform different regressions on each side. lata and regressions. Label Axis.



Team Xiao

Speaker: Yvette

21/16

Writer: MARIAM

endant
Year

Team Leader: NICK

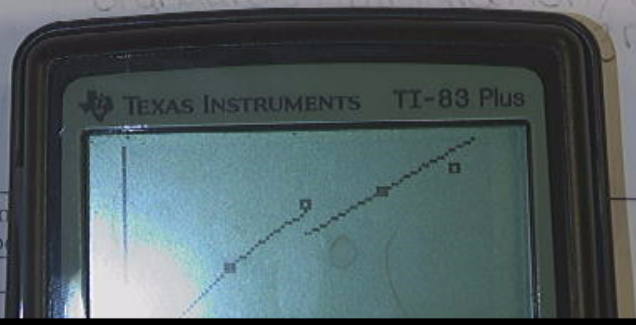
endant
Population

In the beautiful state of New Jersey the population during the years of 1930-

words:

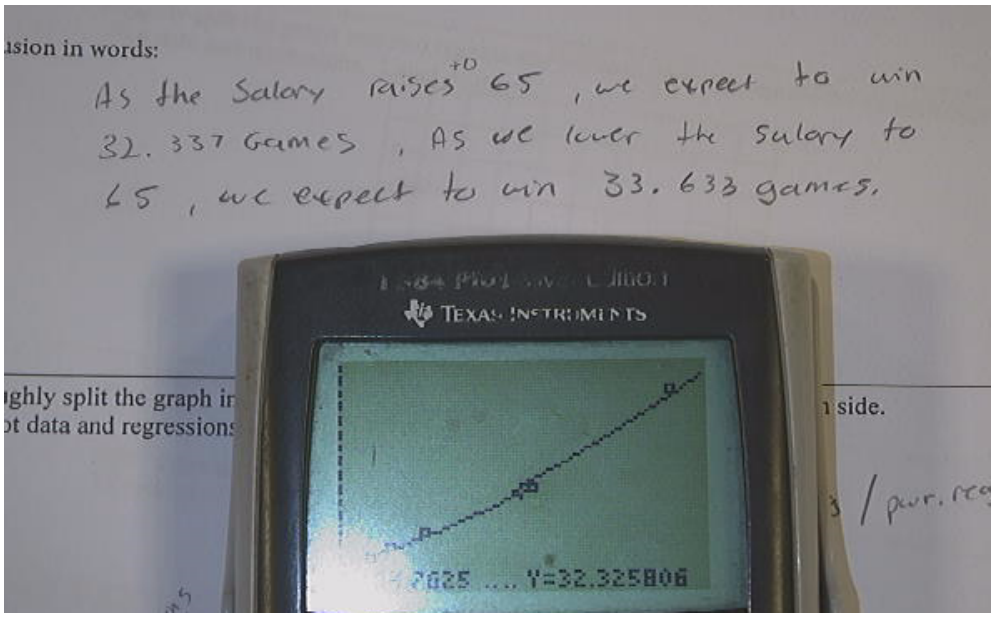
Y

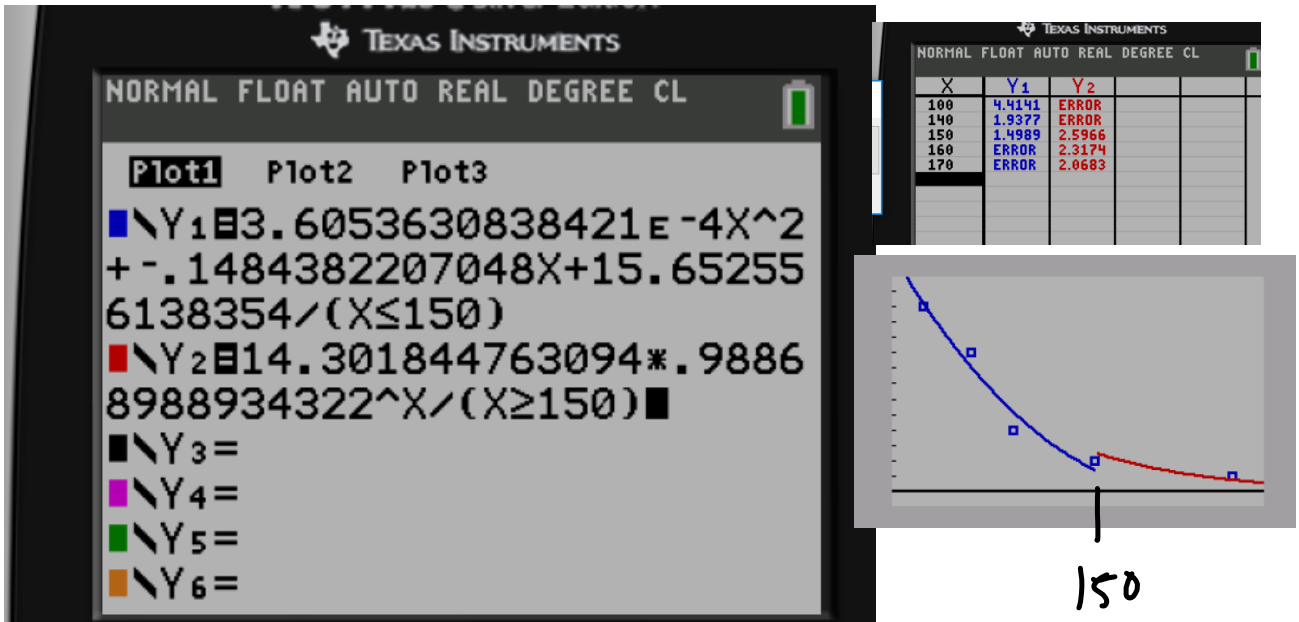
population The Population substantially increased.

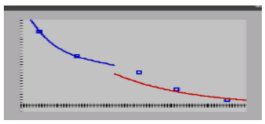


plit the graph into two
and regressions. Lab

10


sion in words:
As the Salary raises +0 65, we expect to win
32.337 Games, As we lower the Salary to
65, we expect to win 33.633 games.
TEXAS INSTRUMENTS
ghly split the graph in
ot data and regressions
side.
2025 ... Y=32.325806


TEXAS INSTRUMENTS
NORMAL FLOAT AUTO REAL DEGREE CL
Plot1 Plot2 Plot3
\Y1=3.6053630838421E-4X^2
+-.148438220704 8X+15.65255
6138354/(X≤150)
\Y2=14.301844763094*.9886
8988934322^X/(X≥150)
\Y3=
\Y4=
\Y5=
\Y6=
STAT PLOT F1 TBLSET F2 FORMAT F3 CALC F4 TABLE F5
Y= WINDOW ZOOM TRACE GRAPH
TEXAS INSTRUMENTS
NORMAL FLOAT AUTO REAL DEGREE CL
X Y1 Y2
100 4.4141 ERROR
140 1.9377 ERROR
150 1.4989 2.5966
160 ERROR 2.3174
170 ERROR 2.0683
150



X	Y1	Y2
30	22.672	ERROR
45	16.744	ERROR
55	14.711	11.724
65	ERROR	8.4355
75	ERROR	6.0696

According to the split regression given, As we increase the price to $55, we epect slaes to be 14.7 Billion

$$\lim_{P \to 55^-} r(x) = 14.7$$