Agenda

Review Quiz 4 and Exam 1

Lecture: Exponentials

Lecture: Transformations of Functions

Project: Exponential Function

Review Questions

Finding the asymptotes of a rational function: Quadratic over linear

Graph all asymptotes of the following function.

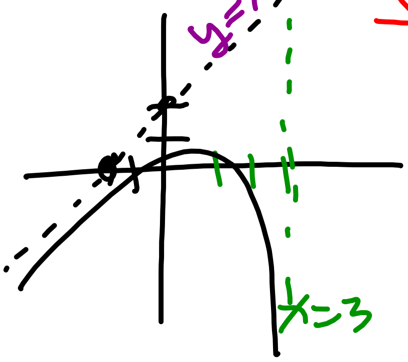
$$f(x) = \frac{x^2 - x + 8}{x - 3} = 0$$

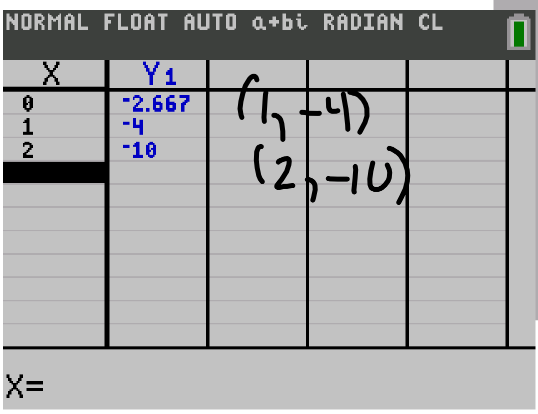
Quiz 4

$$y = x + 2 + \frac{14}{x-3}$$

$$
\begin{array}{r|l}
 & x + 2 \\
x - 3 & x^2 - x + 8 \\
 & -(x^2 - 3x) \\
 & 2x \\
 & -(2x - 6) \\
 & 14
\end{array}
$$

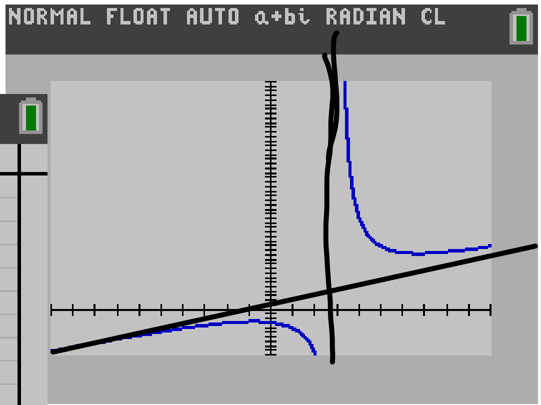
$8 - -6 = 14$





X	Y_1
0	-2.667
1	-4
2	-10

(1, -4)
(2, -10)



$y = x + 2$

Finding the asymptotes of a rational function: Quadratic over linear

Graph all asymptotes of the following function.

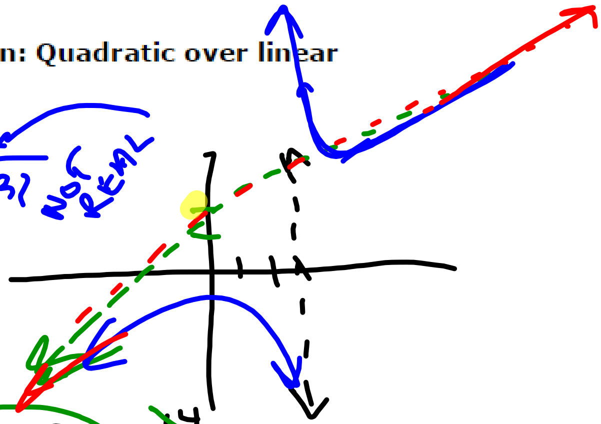
$$f(x) = \frac{x^2 - x + 8}{x - 3}$$

ZN: $1 \pm \sqrt{1-32}$ NOT REAL

ZD: 3

VA: $x = 3$

DN > DD Slant



$y = x + 2 + \frac{14}{x-3}$ → 0

$$\begin{array}{r} x + 2 \\ x - 3 \overline{) x^2 - x + 8} \\ -(x^2 - 3x) \\ \hline 2x + 8 \\ -(2x - 6) \\ \hline 14 \end{array}$$

$-x + (+3x)$

$8 + 6$

$\frac{3}{2}$ Improper $\quad 1\frac{1}{2}$ Mix.

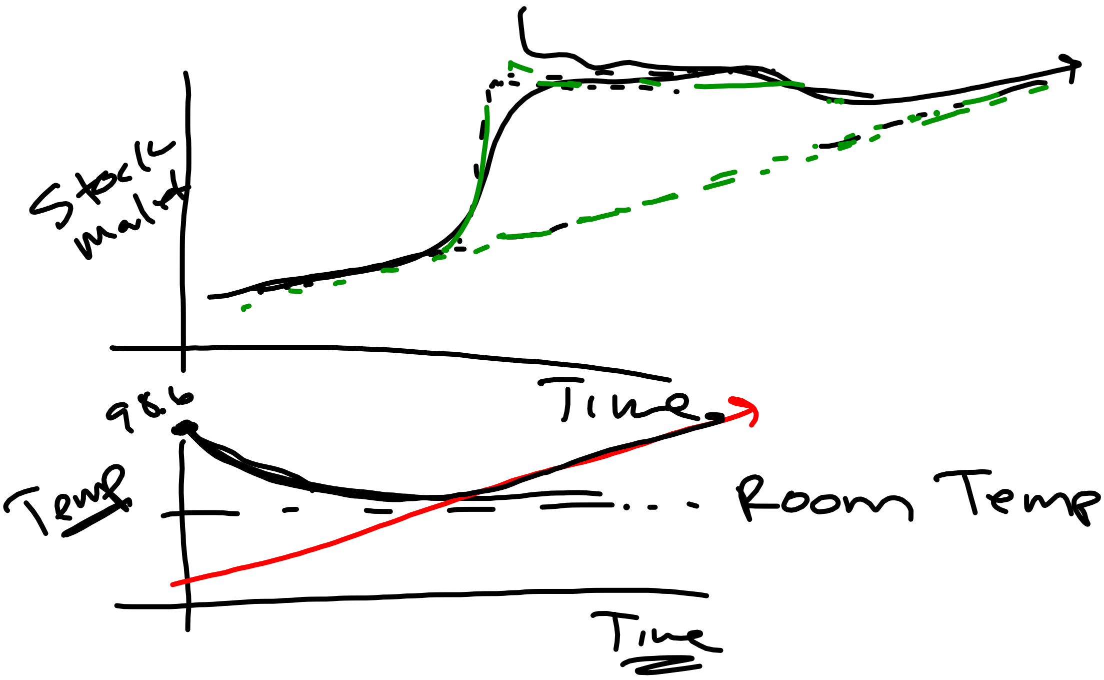
big $\overset{?}{=}$ small

$$\underbrace{\frac{x^2 - x + 8}{x - 3}}_{} = \underbrace{\overset{Q}{x+2} + \overset{R}{\frac{14}{x-3}}}_{}$$

When x is huge

END ∞

$-\infty$



Stock market
Time
98.6
Temp
Room Temp
Time

Solve the following inequality.

$$y = \frac{x+5}{x-1} \le 0$$

$=0$ zeros: -5

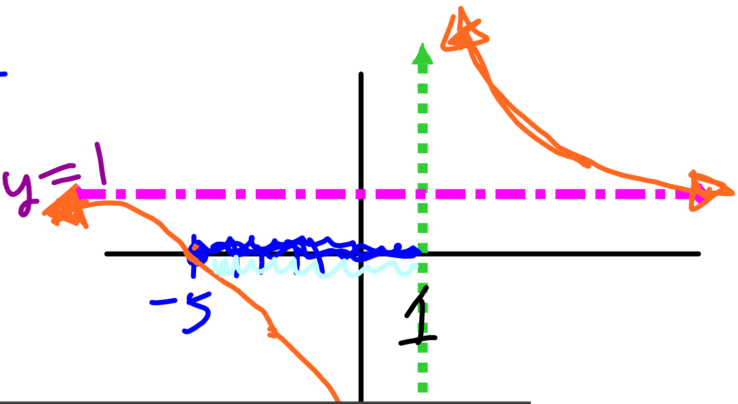
water, beach

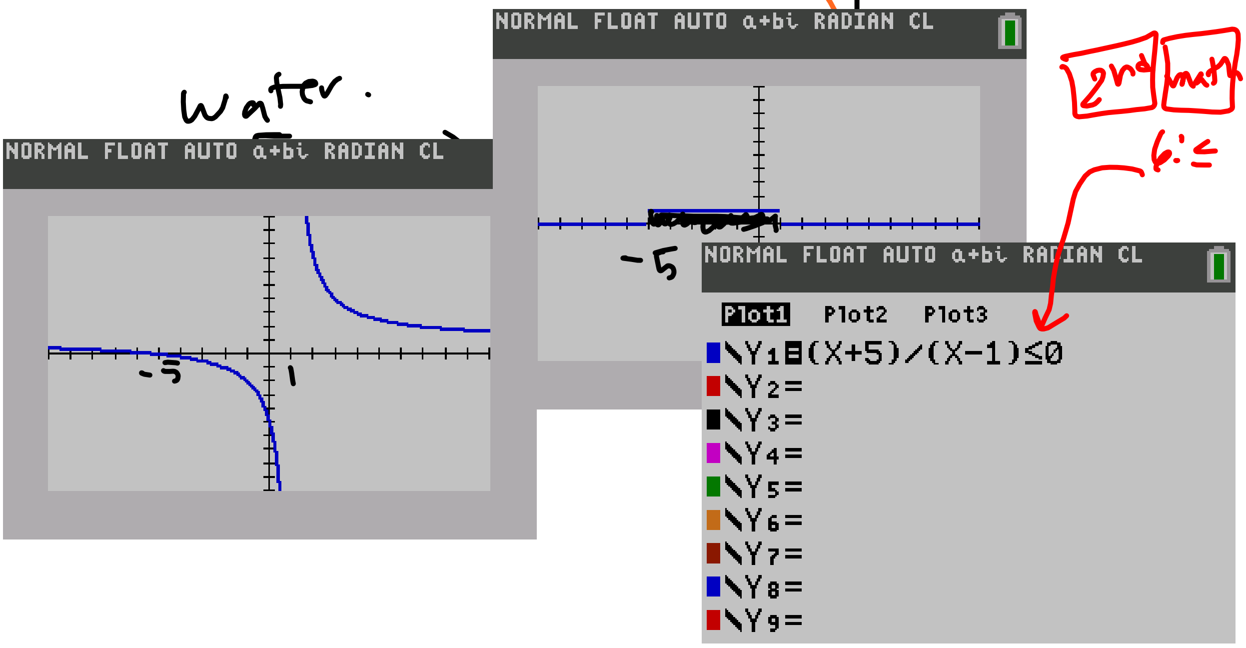
$=0$ VA $x=1$

Write your answer using interval notation.

Your answer:

$$(-\infty, -5] \cup [1, \infty)$$





Solve the following inequality.

$$\frac{x+5}{x-1} \le 0$$

$$y = \frac{x+5}{(x-1)}$$

Water

HA: $DN = DD$

$$y = \frac{LN}{LD} = \frac{1}{1}$$

Write your answer using interval notation.

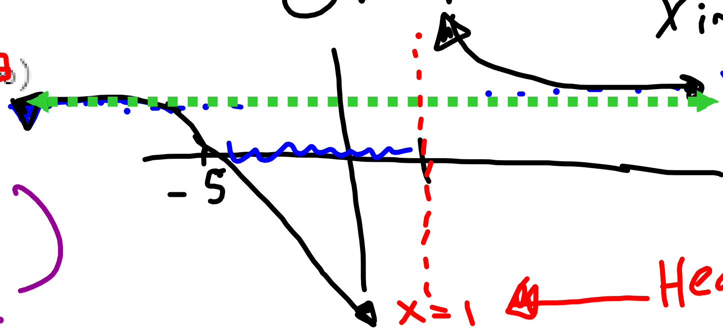
Graph

x_{int} (ZN): -5 Pass

Your answer:

~~$(-\infty, -5] \cup [1, \infty)$~~

$y = 1$



ZD: 1

Heartbeat

$[-5, 1)$

Count shore.

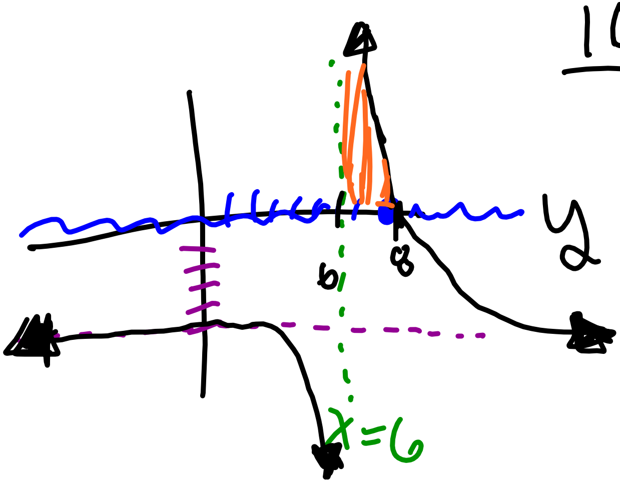
Solve the following inequality.

$$\frac{10}{x-6} \geq 5$$

$$\frac{10}{x-6} - 5 \geq 0$$

LCD: $x-6$

$$\frac{10 - 5(x-6)}{x-6} \geq 0$$



$$y = \frac{40-5x}{(x-6)^1} \geq 0$$

$= 0 \quad x = 8$

greater than = land = Beach.

$= 0 \quad x = 6$

HA: $y = \frac{-5}{1} = -5$

$(6, 8]$

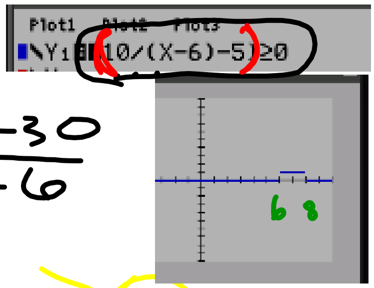
Solve the following inequality.

$\frac{10}{x-6} \ge 5$

$\frac{10}{x-6} - 5 \ge 0$

Y:

$y = \frac{10}{x-6} - 5$



$= \frac{10}{x-6} - \frac{5x-30}{x-6}$

$y = \frac{40-5x}{(x-6)}$ ≥ 0 LAND

ZN: 8 (x int)

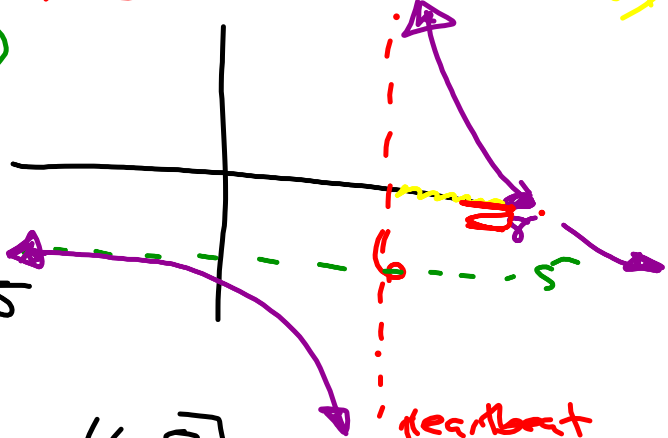
ZD: 6

VA: $x = 6$

HA: DN=DD

$\frac{LN}{LD} = -5$

HA: $y = -5$



Answer $(6, 8]$

Not Answer (white)

$(-\infty, 6) \cup [8, \infty)$

$Y \leq 0$

Graphing a rational function with more than one vertical asymptote

Graph the following rational function.

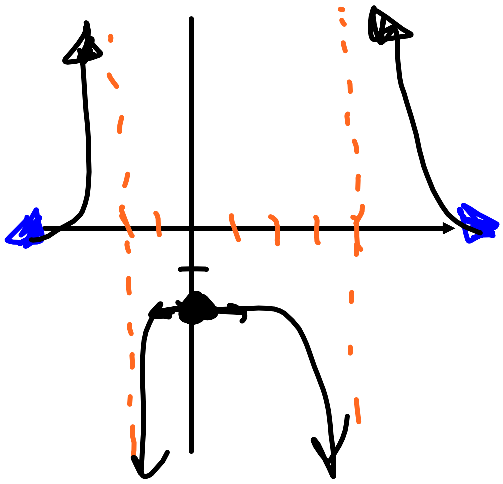
$$f(x) = \frac{16}{x^2 - 2x - 8}$$

ZN: NONE

$(x-4)(x+2) = 0$ ZD: $x = 4, -2$

To graph the function, draw the horizontal and vertical asymptotes (if any), plot the intercepts (if any), and plot at least one point on each side of each vertical asymptote.

Then click on the graph icon.



DN = 0
DD = 2

HA
$y = 0$

Y intercept $(x = 0)$

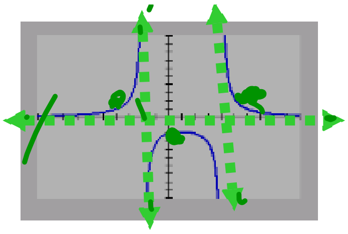
$$f(0) = \frac{16}{0 - 0 - 8} = -2$$

Graphing a rational function with more than one vertical asymptote

Graph the following rational function.

$$f(x) = \frac{16}{x^2 - 2x - 8} = \frac{16}{(x-4)(x+2)}$$

ZN: None

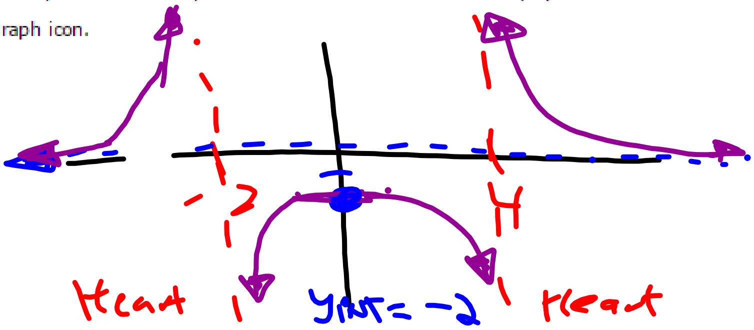


DD > DN

HA: y = 0

To graph the function, draw the horizontal and vertical asymptotes (if any), plot the intercepts (if any), and plot at least one point on each side of each vertical asymptote.

Then click on the graph icon.



y_{int} $(x=0)$: $\frac{16}{-8} = -2$

$-2x = 0$

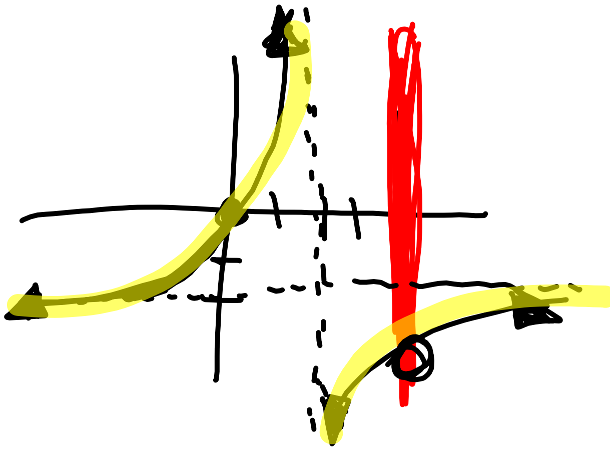
ZN. 0

Graphing rational functions with holes

Graph the rational function $f(x) = \frac{-2x^2+8x}{x^2-6x+8}$. $= \frac{-2x(\cancel{x-4})}{(\cancel{x-4})(x-2)}$ $=0$

$y = \frac{-2x}{x-2}$

HA: $\frac{LN: -2}{LD: 1} = -2$



Graphing rational functions with holes

Graph the rational function $f(x) = \dfrac{-2x^2+8x}{x^2-6x+8}$. $= \dfrac{-2x\cancel{(x-4)}}{(x-2)\cancel{(x-4)}}$

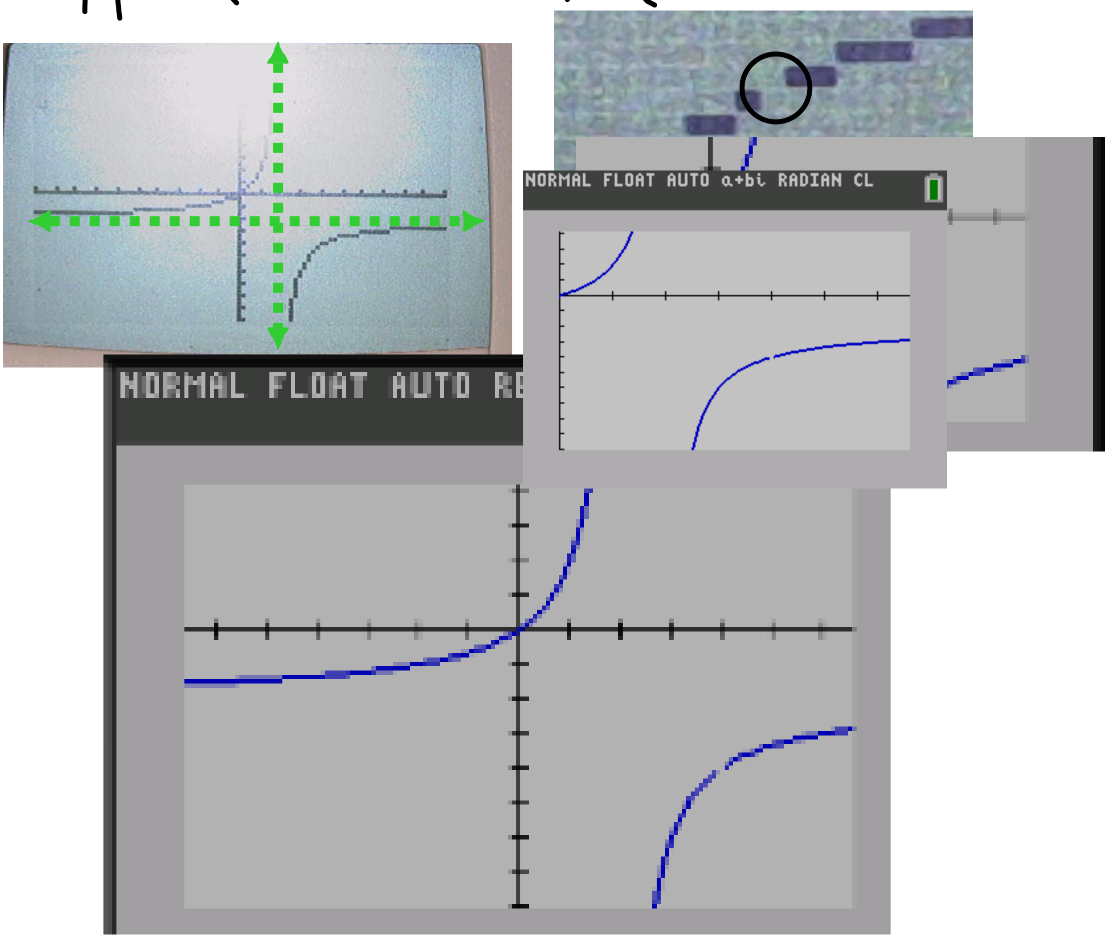
$\boxed{x \neq 4}$

AT $x = 4$

Hole $\left(\frac{-8}{2}\right) = -4$

$Y_1 = (-2x^2+8x)/(x^2-6x+8)$

C



Zero	Factor
2	$x-2$
$3+i$	$x-(3+i)$
$3-i$	$x-(3-i)$

$(x-2)(x-3+i)(x-3-i)$

These factors give the following polynomial in factored form.

$$f(x) = (x-2)(x-(3+i))(x-(3-i))$$

$(x-2)(x-3+i)(x-3-i)$

Note that this polynomial has degree 3.

$(x-2)((x-3)+i)((x-3)-i)$

We multiply the factors to get the answer.

$(x-2)[(x^2-6x+9)-i^2]$

$$(x-2)(x-(3+i))(x-(3-i))$$

$(x-2)(x^2-6x+10)$

$$= (x-2)(x^2-6x+10)$$

More

$$\begin{array}{r} x^2-6x+10 \\ x-2 \\ \hline x^3-2x^2+12x-20 \\ -6x^2\quad 10x \\ \hline x^3-8x^2+22x-20 \end{array}$$

Lecture: Exponential Functions

$f(x) = B^{x}$ exponent

base

40 mins	300		
60 min	600	$\times 2$	$2^{\boxed{?}}$
80 min	1200	$\times 2$	2^{x}

Interest Rate Formulas

I = interest

P = principal

R = rate

T = time

simple

$I = PRT$

$100

5% → .05 per yr.

2 yr

per cent

5 / 100 = .05

$I = 100 \cdot .05 \cdot 2$

$= \$10$

Compound Interest

P = Ending Amount
Q = Starting Amount
R = Rate
N = Means......
T = Time

Interest	
Annual	N = 1
Quarterly	N = 4
Monthly	N = 12
Daily	N = 365

$$\boxed{P = Q\left(1 + \frac{R}{N}\right)^{NT}}$$

$= Q(1 + R/N)\wedge(N \cdot T)$

$= \$1000(1 + .02/365)\wedge(365 \cdot 5)$

5 yrs

\$100 at .5% = 100.50

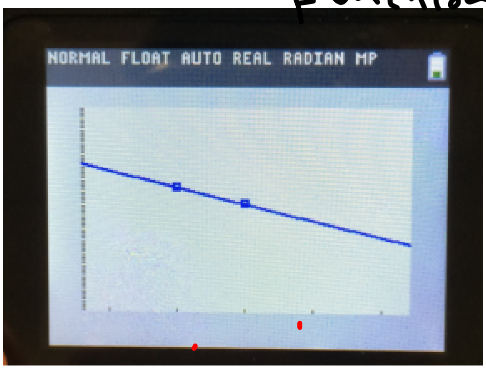
1st yr $100\,(1.005) = 100.50$

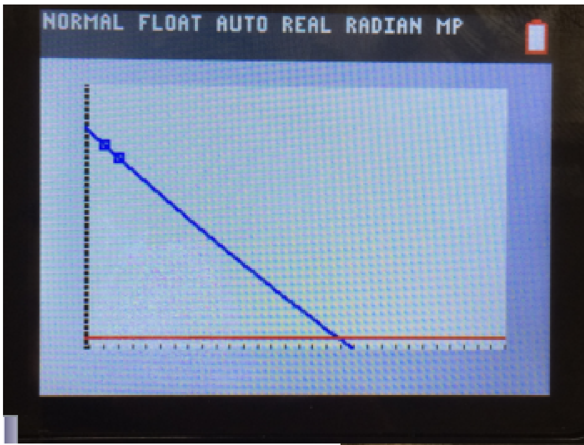
2nd yr $\underline{100}\,(\underline{1.005})^{1}(\underline{1.005})^{1} = \underline{101.0025}$

10 yr $100\,(1.005)^{10} = 105.114$

100 yrs $100\,(1.005)^{100} = 164.67$

Exponential Functions





exponential decay

$$y = A \cdot B^x$$

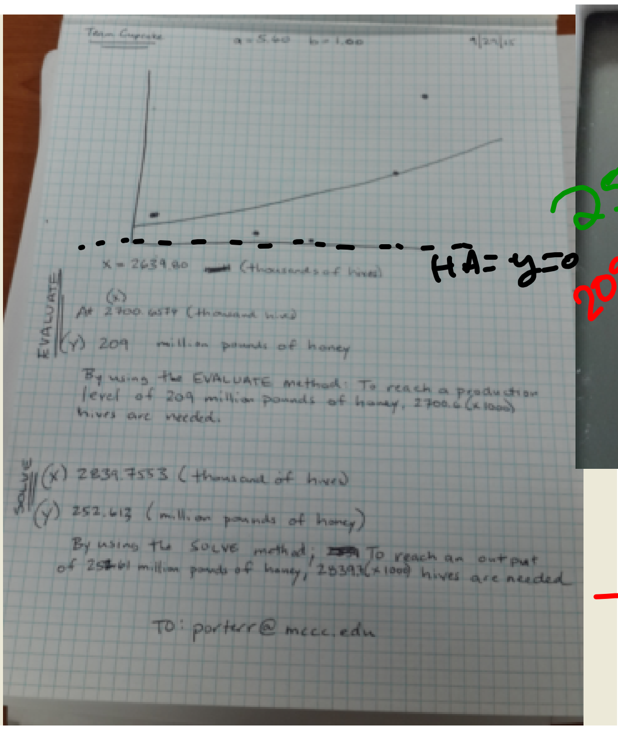
School Board

In the year 2006 there were 492 recorded concussions and according to our regression there is a steady decrease leading to 400 concussions in the year 2023.

NORMAL FLOAT AUTO R
PRESS + FOR △Tbl

X	Y_1
7	486
8	480.07
9	474.22
10	468.44
11	462.72
12	457.08
13	451.51
14	446
15	440.56
16	435.19
17	429.88

X=17


Team Cupcake a = 5.60 b = 1.00 4/29/15

x = 2639.80 (thousands of hives)

EVALUATE

(x) At 2700.6574 (thousand hives)

(y) 209 million pounds of honey

By using the EVALUATE method: To reach a production level of 209 million pounds of honey, 2700.6 (x1000) hives are needed.

SOLVE

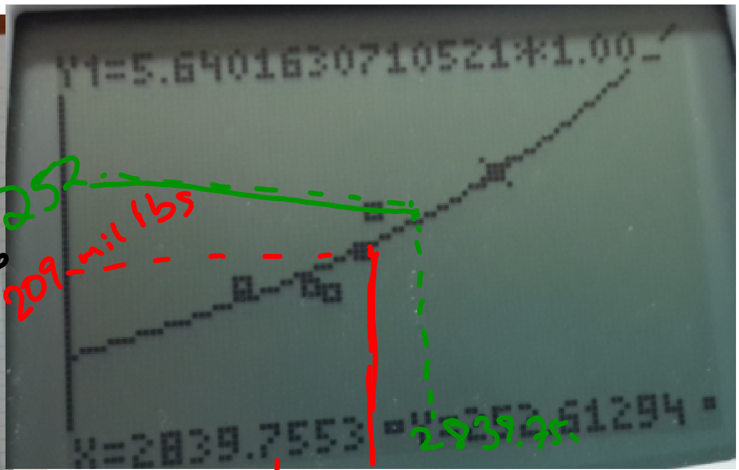
(x) 2839.7553 (thousand of hives)

(y) 252.613 (million pounds of honey)

By using the SOLVE method, To reach an output of 252.61 million pounds of honey, 2839.3 (x1000) hives are needed.

TO: porterr@mccc.edu

HA= y=0



252

209 mil lbs

2839.75

Exponential Growth

2700 Hives

Get 209 lbs

Evaluating

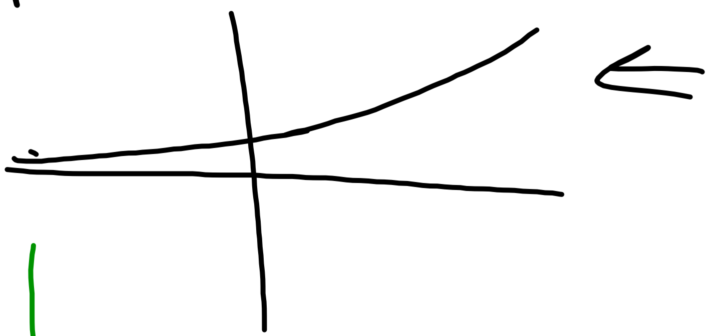
Pick x → get y

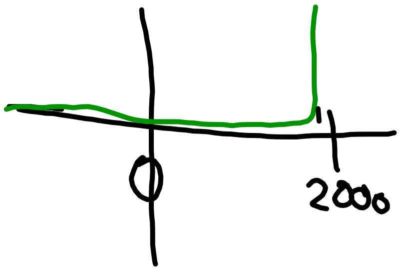
Want y = 252 lbs

Solve

Pick y → get x

Exponential Growth





1.008

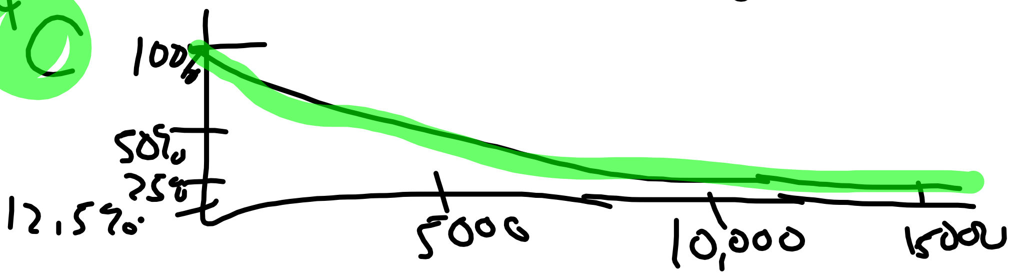
5% interest

$\$100(1.05) = \$105$

$100(1.05)^{13} = 200.$

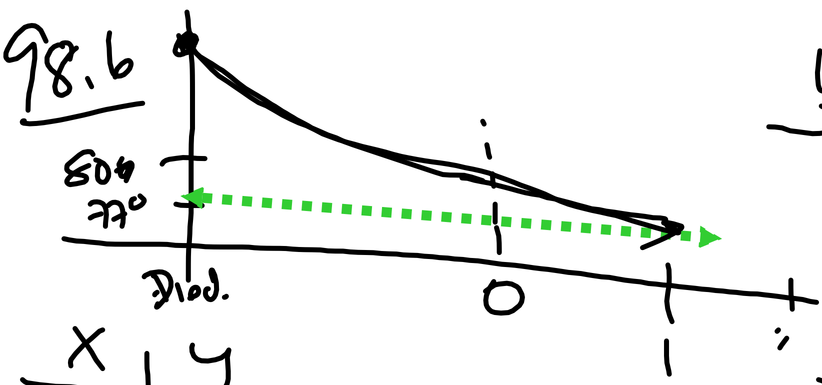
Exponential Decay

^{14}C

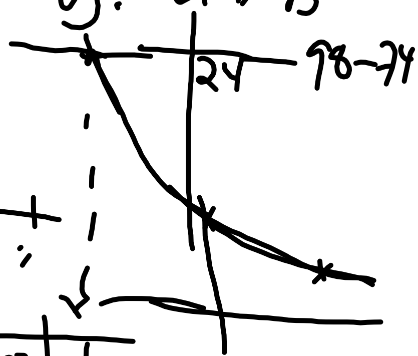


carbon dating

20,000	6.25
25,000	3.125



$y = a * b^x$



x	y	
0	80°	$-74° = 6$
1	77°	$-74° = 3$
∞	74°	$-74° = 0$

$$\begin{array}{r} 98.6 \\ -74 \\ \hline 24.6 \end{array}$$

0	6
1	3

$x = {}^{-}1.9$

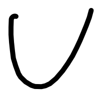
Lecture : Transformation of Functions

Transformation of Functions

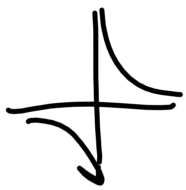
Person --------> Werewolf

Parent Functions:

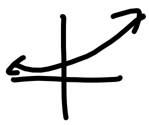
$f(x) = x^2$



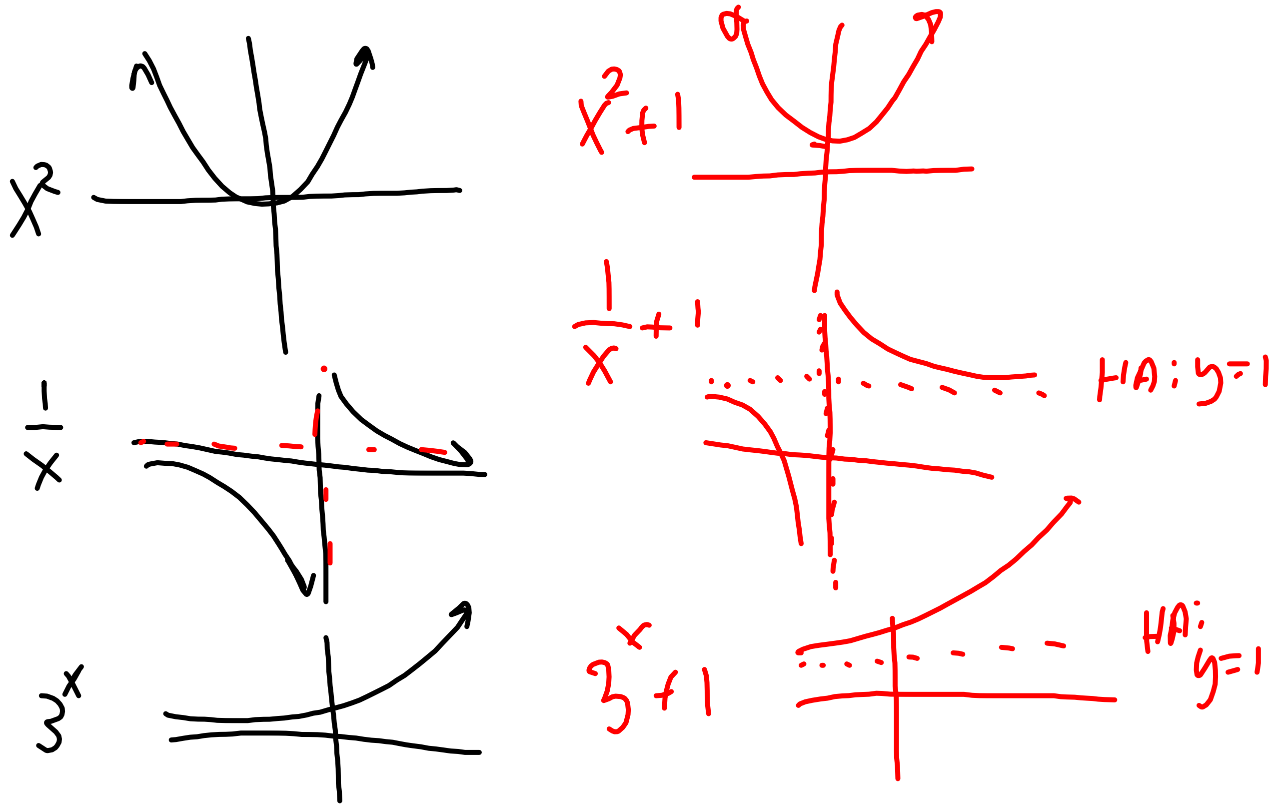
$g(x) = 1 / x$



$h(x) = 1.2^x$

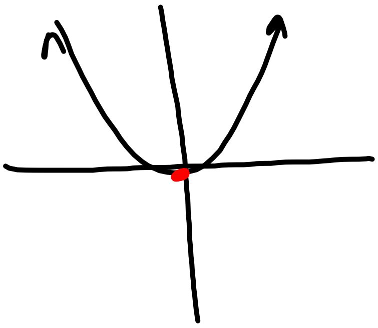


	Inside	Outside
+	Left	Raise
−	Right	Lower
2,3,4.. $\times 1^{+}$	"smush"	Stretch
$\frac{1}{2}, \frac{1}{3}, .9 \times 1^{-}$	"pull"	Shrink
−	Reflects Y-axis	Reflects X-axis

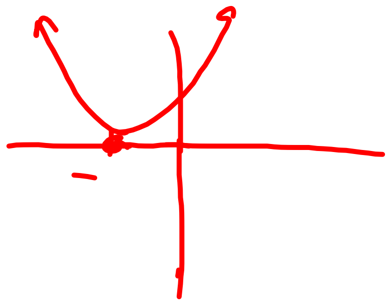

x^2
$\frac{1}{x}$
3^x
x^2+1
$\frac{1}{x}+1$
HA: y=1
3^x+1
HA: y=1

Left by 1

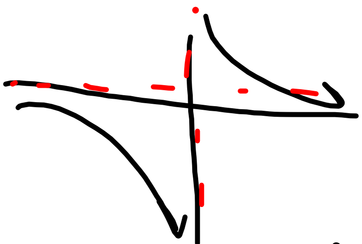
x^2



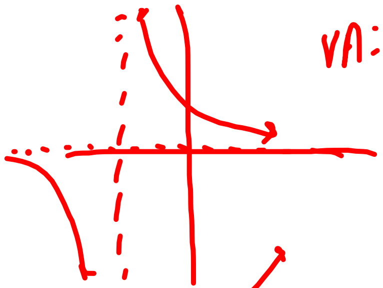
$(x+1)^2$



$\frac{1}{x}$

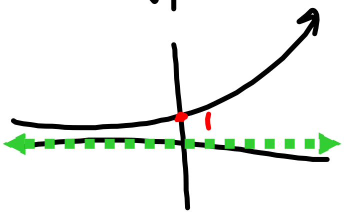


$\frac{1}{x+1}$

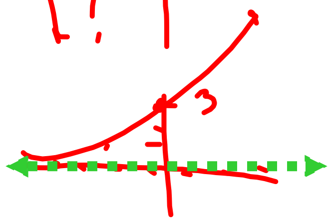


VA: $x=-1$

3^x



3^{x+1}

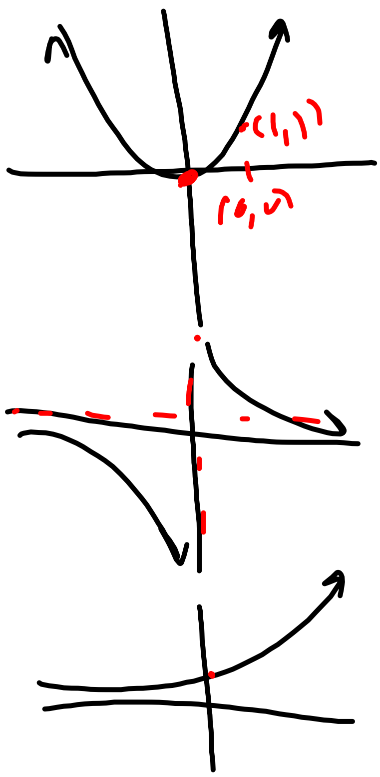


STRETCH BY 3

x^2

$\frac{1}{x}$

3^x

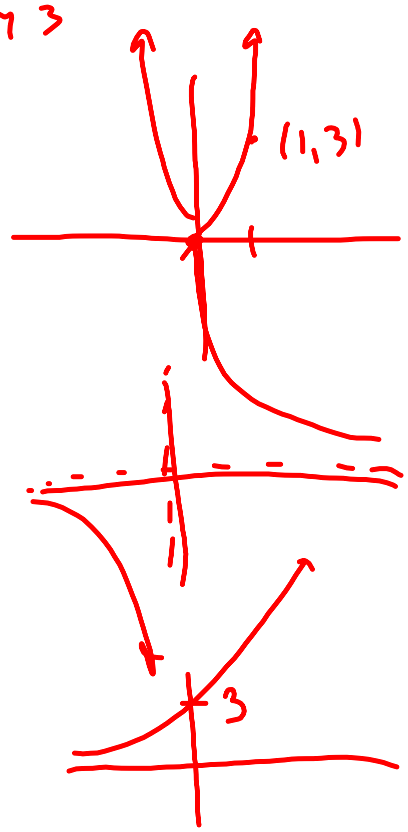


$3x^2$

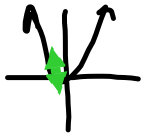
$\frac{3}{x}$

$3^1 \cdot 3^x$

3^{x+1}



Ex $3(x-1)^2+7$ Vertex $(1,7)$

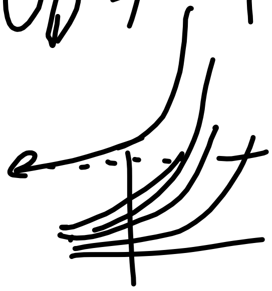
Graph: Parent: x^2 

Order: (PEMDAS)

-1	Inside	Right by 1
3	Outside	Stretch
7	Outside	Up 7

Parent 3^x

$3\cdot 3^{x-1}+7$



HA: $y=7$

natural exponent

"e" $= .2.71\ldots$ (like π)

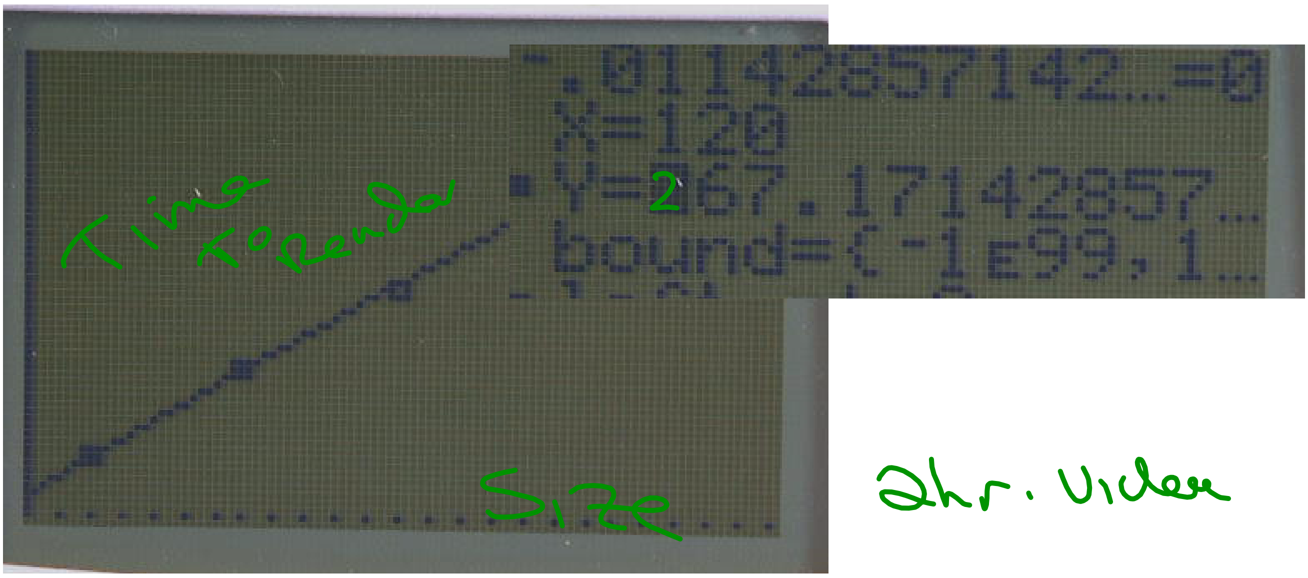
Formula

$$\boxed{P = Q e^{RT}}$$

(Compound continuously $N = \infty$)

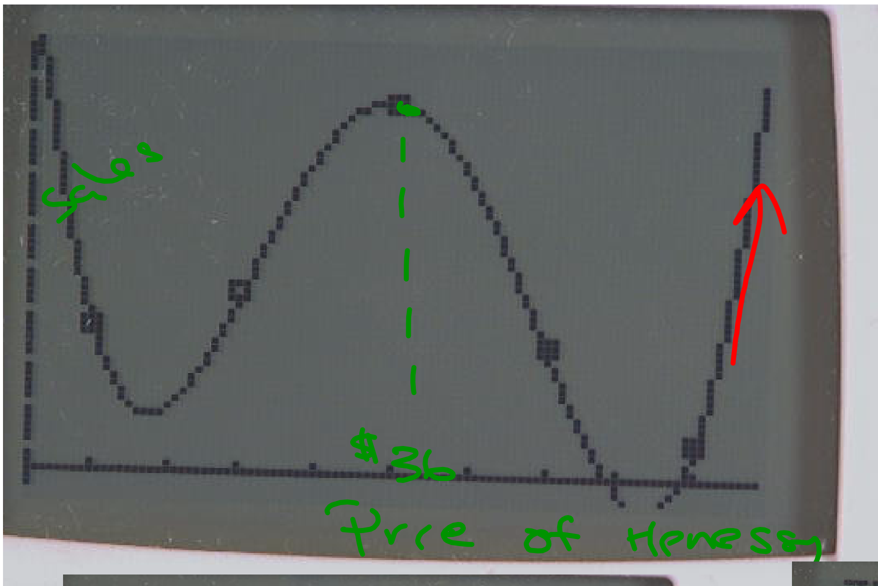
Project

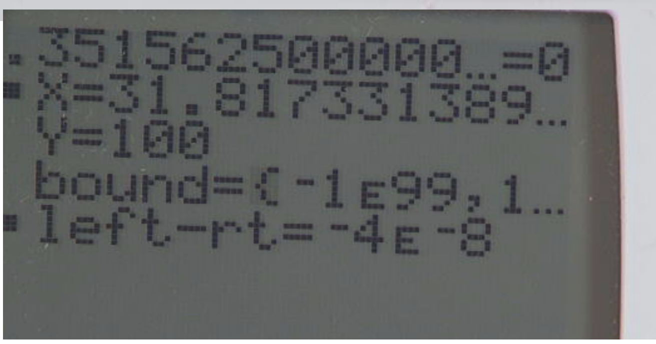
Predict using Exponential regression

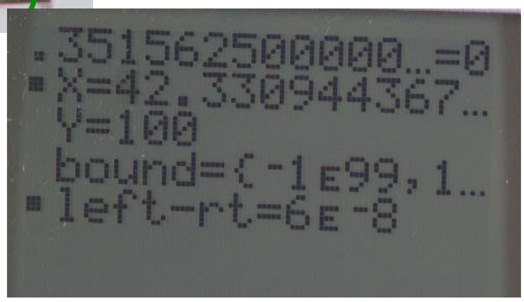


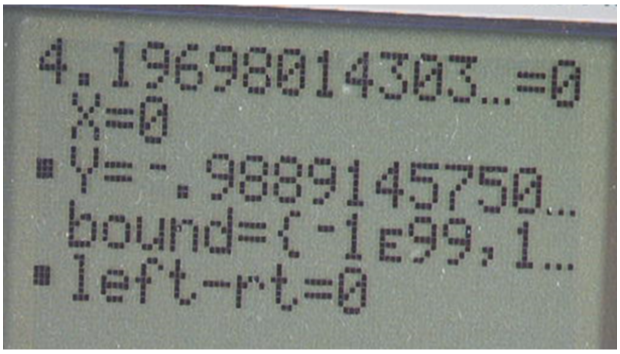
.01142857142…=0
X=120
Y=267.17142857…
bound={-1E99,1…
Time to render
Size

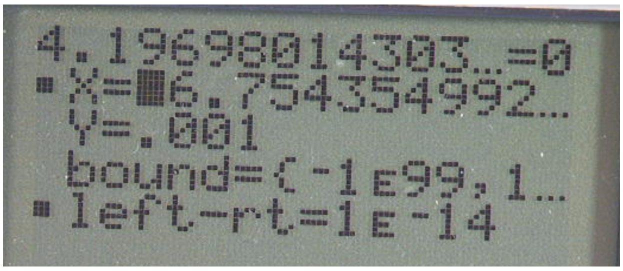
2hr. video

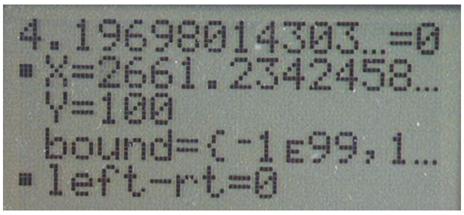

Sales
$36
Price of Henessy

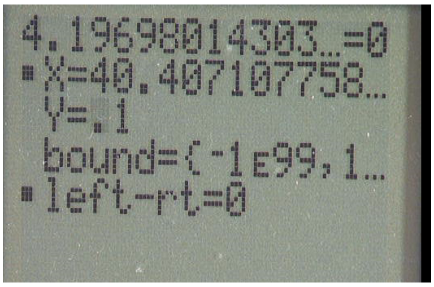

.351562500000...=0
X=31.817331389...
Y=100
bound={-1E99,1...
left-rt=-4E-8

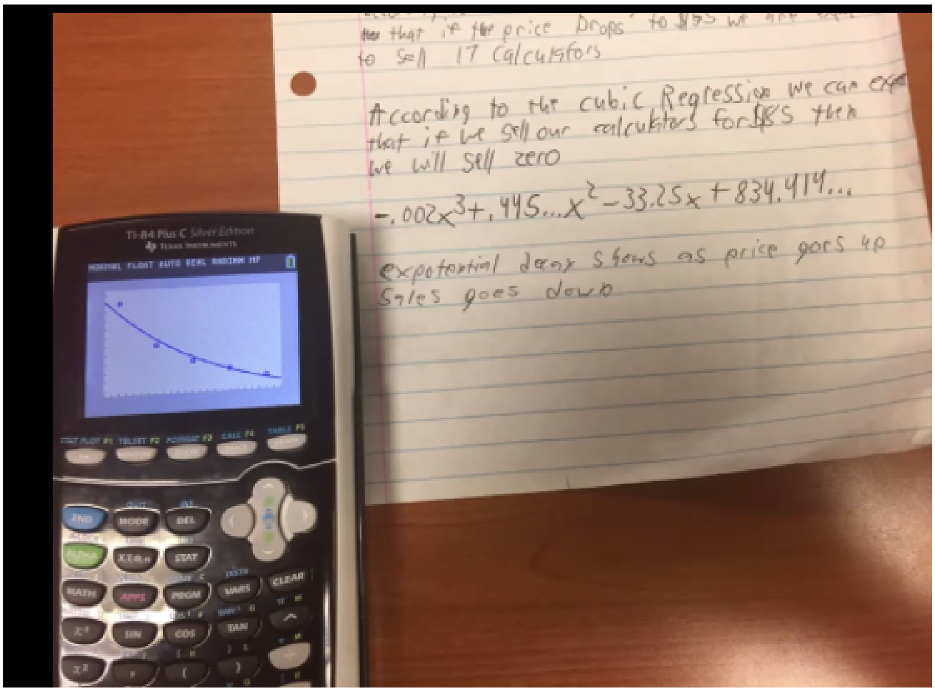

.351562500000...=0
X=42.330944367...
Y=100
bound={-1E99,1...
left-rt=6E-8


4.19698014303…=0
X=0
Y=-.9889145750…
bound={-1E99,1…
left-rt=0


4.19698014303…=0
X=6.754354992…
Y=.001
bound={-1E99,1…
left-rt=1E-14


4.19698014303…=0
X=2661.2342458…
Y=100
bound={-1E99,1…
left-rt=0


4.19698014303…=0
X=40.407107758…
Y=.1
bound={-1E99,1…
left-rt=0


that if the price Drops to $95 we are
to sell 17 calculators
According to the cubic Regression we can expe
that if we sell our calculators for $85 then
we will sell zero
-.002x3+.445...x2-33.25x+834.414...
expotential decay shows as price goes up
Sales goes down
TI-84 Plus C Silver Edition
Texas Instruments