Agenda

Homework Review

Lecture: Continuity

Classwork

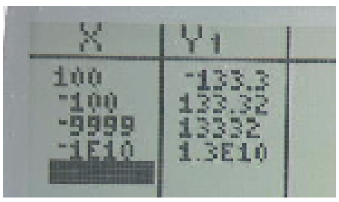
Homework:

Limits at infinity and rational functions

Find the following limits.
If necessary, select the most informative answer from ∞ , $-\infty$, and "Does Not Exist."

(a) $\lim_{x \to -\infty} \dfrac{4x^3 - 7}{-2 - 3x^2} =$

(b) $\lim_{x \to \infty} \dfrac{7x + 1}{4 - 5x} =$



Limits at infinity and rational functions

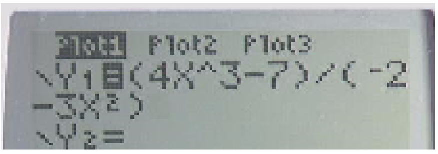
Find the following limits.
If necessary, select the most informative answer from ∞ , $-\infty$, and "Does Not Exist."

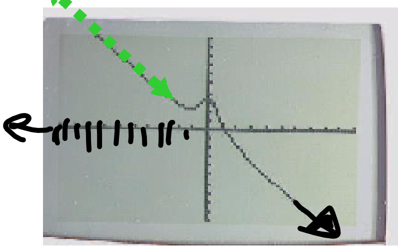
Left END

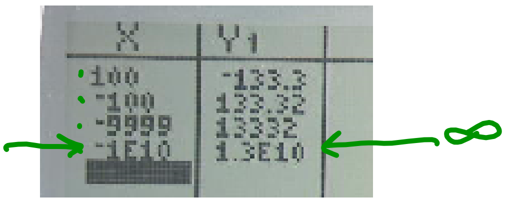
(a) $\lim_{x \to -\infty} \dfrac{4x^3 - 7}{-2 - 3x^2} = \infty$

Right END

(b) $\lim_{x \to \infty} \dfrac{7x + 1}{4 - 5x} = -\dfrac{7}{5}$





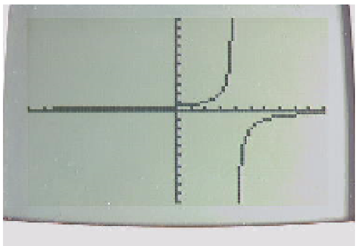


Infinite limits and rational functions

Find the following limits for $f(x) = \frac{2}{4-x}$ and $g(x) = \frac{-4x}{(x-2)^2}$.

If necessary, select the most informative answer from ∞ , $-\infty$, and "Does Not Exist."

$\lim_{x\to 4^-} f(x) = \square$	$\lim_{x\to 2^-} g(x) = \square$
$\lim_{x\to 4^+} f(x) = \square$	$\lim_{x\to 2^+} g(x) = \square$
$\lim_{x\to 4} f(x) = \square$	$\lim_{x\to 2} g(x) = \square$

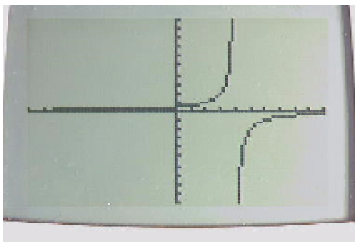


Infinite limits and rational functions

Find the following limits for $f(x) = \dfrac{2}{4-x}$ and $g(x) = \dfrac{-4x}{(x-2)^2}$

If necessary, select the most informative answer from ∞, $-\infty$, and "Does Not Exist."

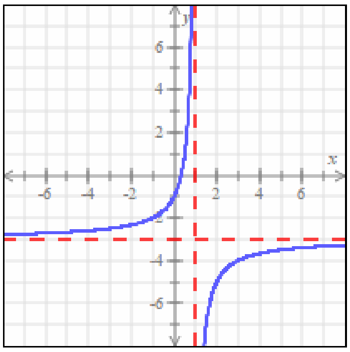
Left	$\lim_{x\to 4^-} f(x) = \infty$	$\lim_{x\to 2^-} g(x) = -\infty$
Right	$\lim_{x\to 4^+} f(x) = -\infty$	$\lim_{x\to 2^+} g(x) = -\infty$
Both	$\lim_{x\to 4} f(x) =$ DNE	$\lim_{x\to 2} g(x) = -\infty$



Limits at infinity and graphs

Use the graph of $f(x) = \dfrac{1-3x}{x-1}$ and its asymptotes to find the following limits.

If necessary, choose the most informative answer from ∞, $-\infty$, and "Does Not Exist."



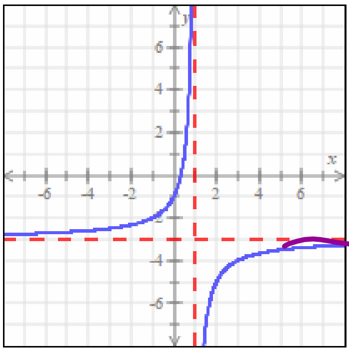
(a) $\lim_{x \to \infty} f(x) = \square$

(b) $\lim_{x \to -\infty} f(x) = \square$

Limits at infinity and graphs

Use the graph of $f(x) = \dfrac{1-3x}{x-1}$ and its asymptotes to find the following limits.

If necessary, choose the most informative answer from ∞, $-\infty$, and "Does Not Exist."



Right End

(a) $\lim_{x \to \infty} f(x) = $ ▯ -3

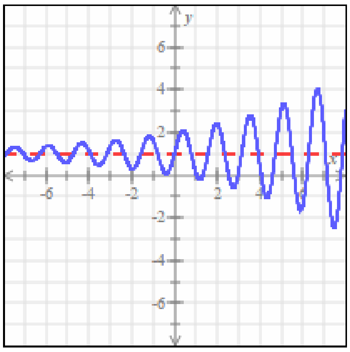
(b) $\lim_{x \to -\infty} f(x) = $ ▯ -3

$\lim_{x \to \infty^+} f(x) = \text{DNE}$

$\lim_{x \to -\infty^-} g(x) = \text{DNE}$

Use the graph of $h(x) = \sin(4x)e^{[illegible]} + 1$ and its asymptote to find the following limits.

If necessary, choose the most informative answer from ∞ , $-\infty$, and "Does Not Exist."

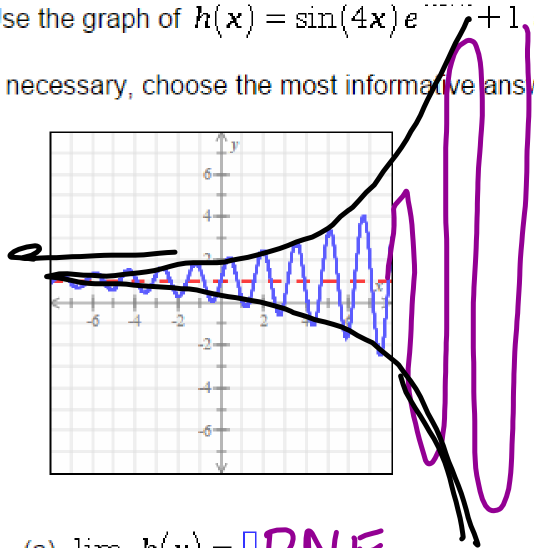


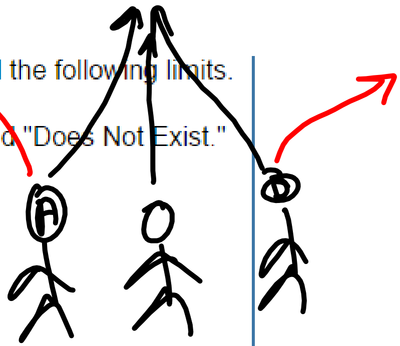
(a) $\lim\limits_{x \to \infty} h(x) = \square$

(b) $\lim\limits_{x \to -\infty} h(x) = \square$

Use the graph of $h(x) = \sin(4x)e^{x} + 1$ and its asymptote to find the following limits.

If necessary, choose the most informative answer from ∞, $-\infty$, and "Does Not Exist."





(a) $\lim_{x \to \infty} h(x) =$ DNE

(b) $\lim_{x \to -\infty} h(x) =$ 1

SQUEEZE Theorem

$-e^{x} \le \sin(4x)e^{x} \le e^{x}$

$\lim_{x \to -\infty} -e^{x} = 0$ $\to 0$ by squeeze. $\lim_{x \to -\infty} e^{x} = 0$

Lecture: Continuity

Overview:

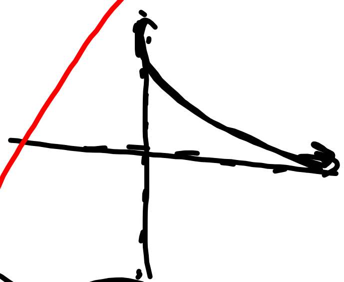
What is Calculus?

What is zero times infinity?

Zero * Infinity = could be anything?

$$\lim_{x\to\infty} x = \infty$$

$$\lim_{x\to\infty} \frac{B}{x} = 0$$



$$\lim_{x\to\infty} x \cdot \frac{B}{x} = B$$

$$\lim_{x\to\infty} x^2 \frac{B}{x^3} = 0$$

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

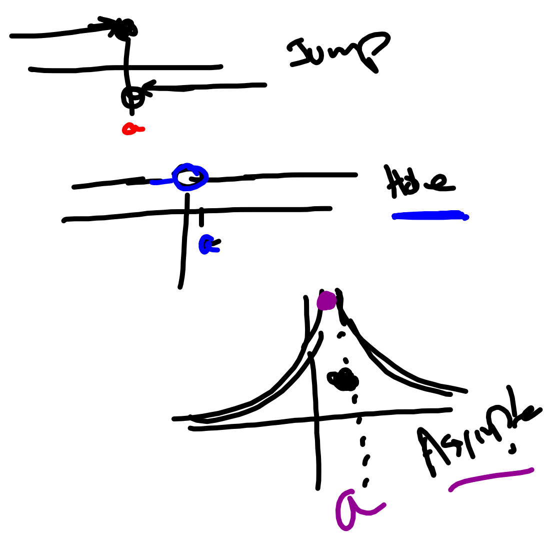
CONTINUITY

1. LIMIT EXISTS

2. FUNCTION EXISTS

3. LIMIT = FUNCTION

Examples



CONTINUITY

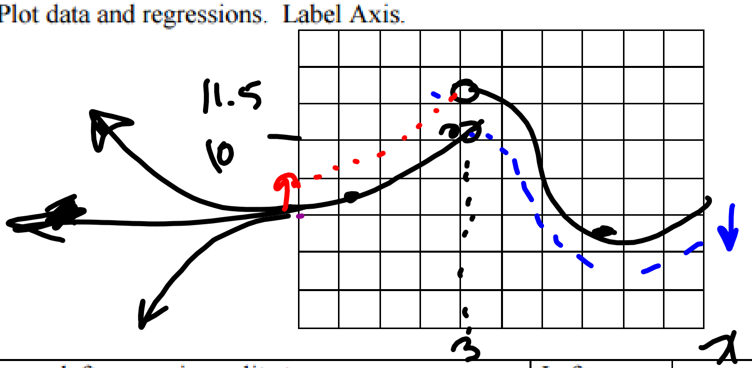
1. LIMIT EXISTS

2. FUNCTION EXISTS

3. LIMIT = FUNCTION

Inner Limit

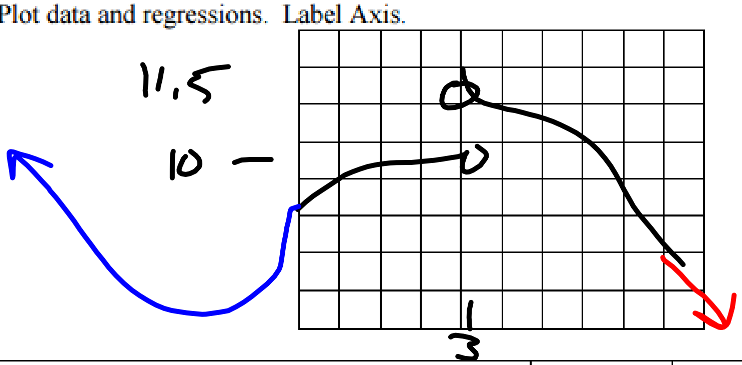
2. Roughly split the graph into two regions and perform different regressions on each side.
Plot data and regressions. Label Axis.



left regression split at a Y1=vars 5: > > 1: RegEq /(x≤a) right regression Y2=vars 5: > > 1: RegEq /(x≥a)	Left Regression used:	Cubic y=-3..
	Right Regression used:	Quartic y=-2..
	Location of split (a)	3
Find Y1(a) Y2(a) — x: 3, Y1: 10, Y2: 11.5	$\lim_{x\to a^-} r(x)$	10
	$\lim_{x\to a^+} r(x)$	11.5

Outer Limit

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

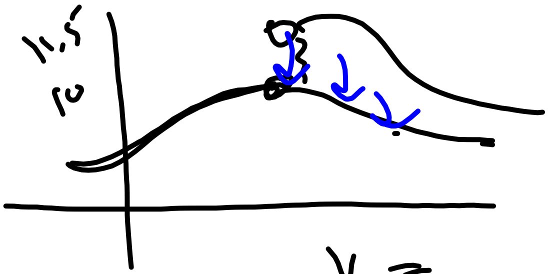


left regression split at a Y1=vars 5: > > 1: RegEq /(x≤a) right regression Y2=vars 5: > > 1: RegEq /(x≥a)	Left Regression used:	Cubic y=−
	Right Regression used:	Quartic y=−
Find Y1(-9999) Y2(9999)	$\lim_{x\to-\infty} r(x)$	$+\infty$
	$\lim_{x\to+\infty} r(x)$	$-\infty$

	Y_1	Y_2
9999	Error	−1.9E99
−9999	−1...	Error

Classwork:

Make the function continuous

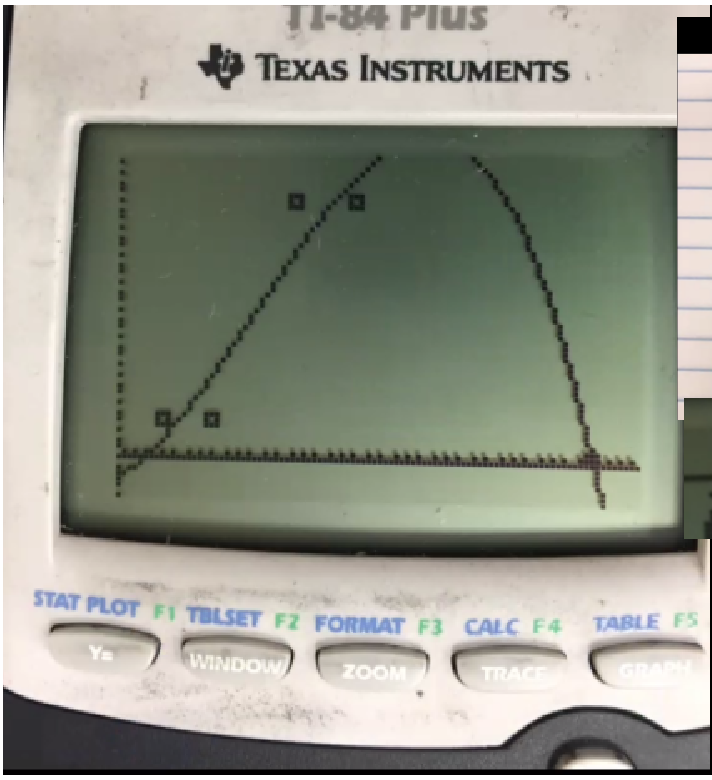


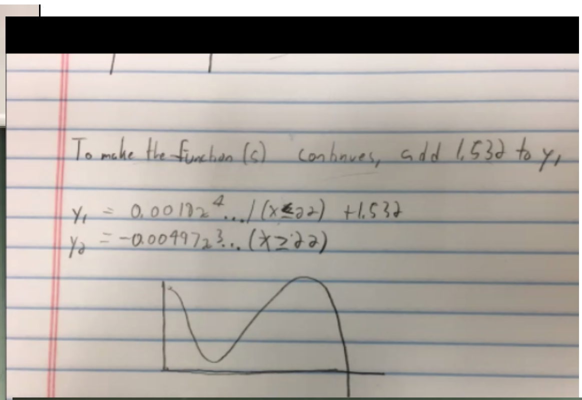
1.5

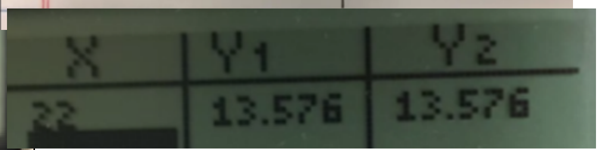
$y_1 =$ ______ $(x<a)$

$y_2 =$ ______ $(x>a) - 1.5$

$\lim_{x \to 3} r(x) = 10$

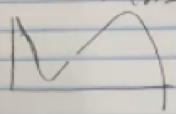

TI-84 Plus
TEXAS INSTRUMENTS
STAT PLOT F1
TBLSET F2
FORMAT F3
CALC F4
TABLE F5
Y=
WINDOW
ZOOM
TRACE


To make the function (s) continues, add 1.532 to y1
y1 = 0.00182x^4…/(x≤22) +1.532
y2 = −0.00497x^3…(x≥22)


X
Y1
Y2
13.576
13.576

y_1 = quartic / ($x \leq 22$)
y_2 = cubic / ($x \geq 22$)

$y_1 = 0.0019x^4 - 0.22x^3 + 9.45x^2 - 165.92x + 1033.56 / (x \leq 22$
y_2 $-0.00497x^3 \ldots / (x \geq 22)$

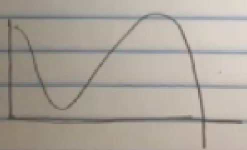


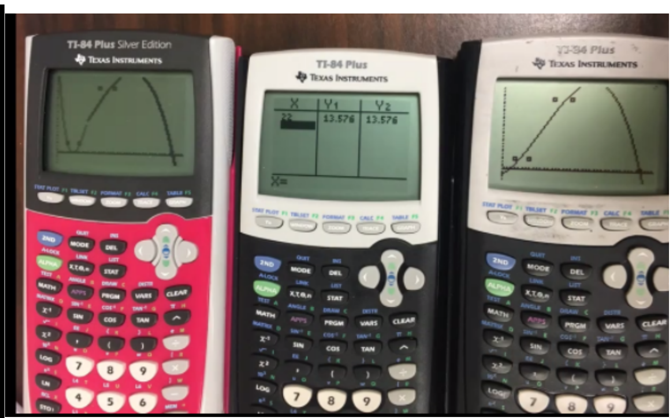
X	Y_1	Y_2
22	12.044	13.576

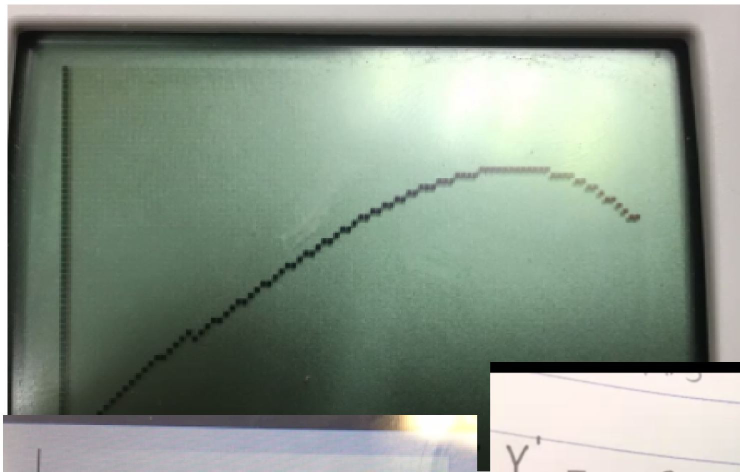
→ 13.576 − 12.044 = 1.532

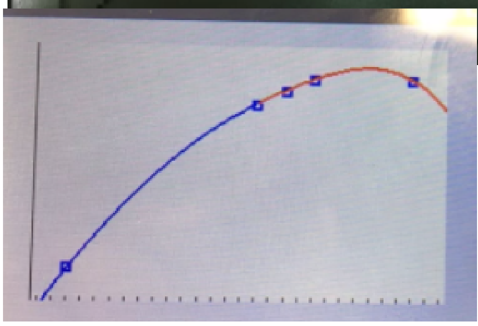
To make the function (c) continues, add 1.532 to y_1

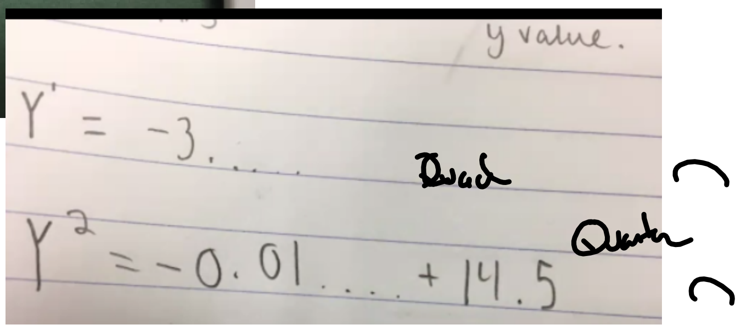
$y_1 = 0.0019x^4 \ldots / (x \leq 22) + 1.532$
$y_2 = -0.00497x^3 \ldots (x \geq 22)$

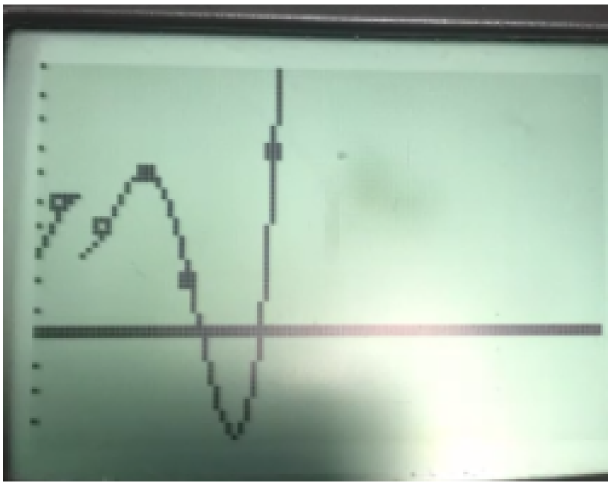


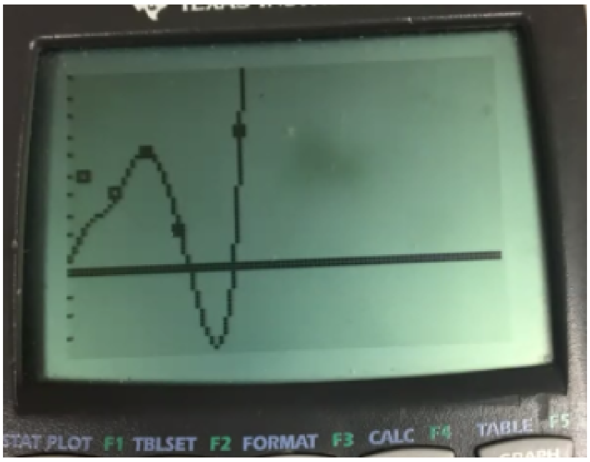




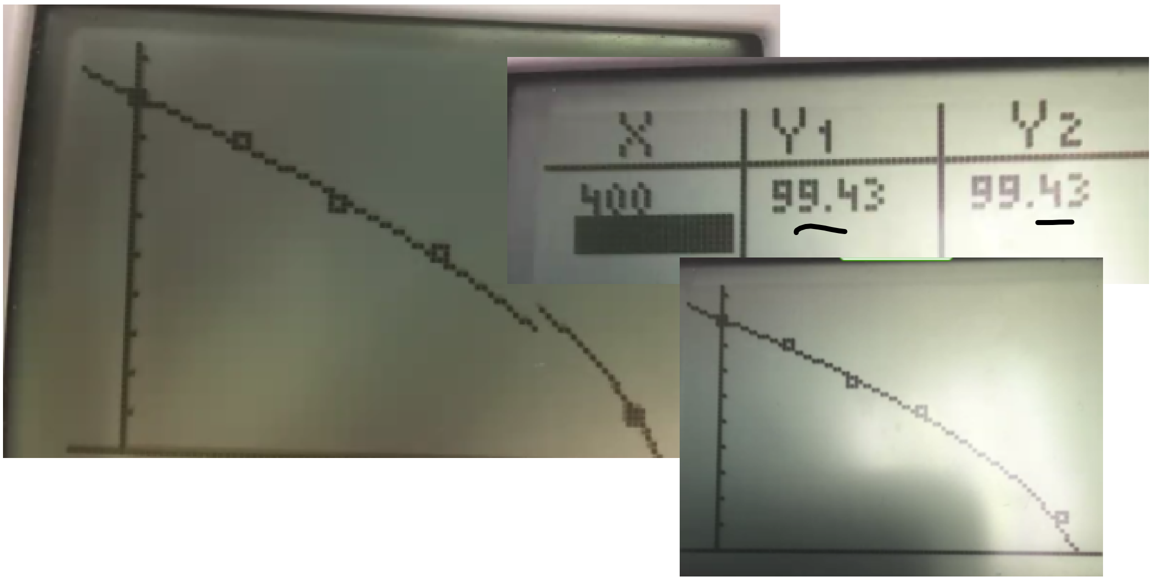


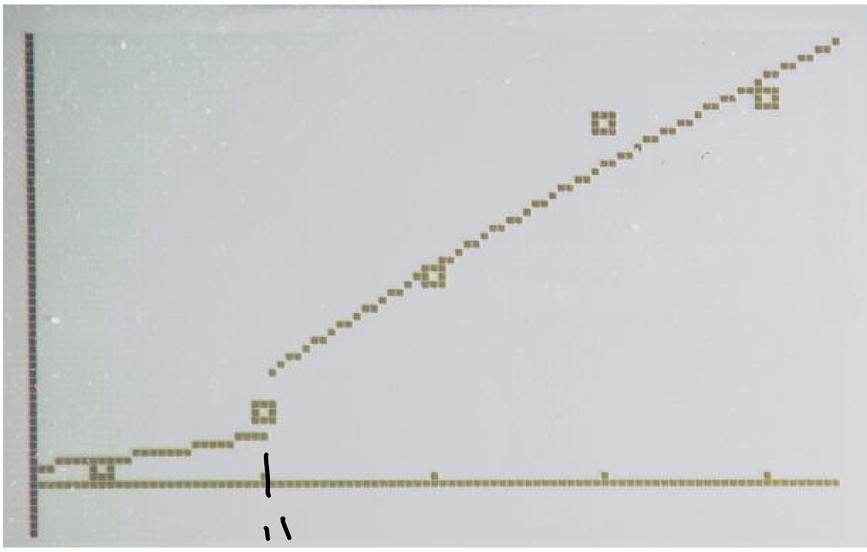

y value.
Y' = -3.....
Quad
Y^2 = -0.01.... + 14.5
Quartic





According to the split regressions, as we approach 250,000 in property costs, the number of available homes is 5.3402


X
Y1
Y2
400
99.43
99.43

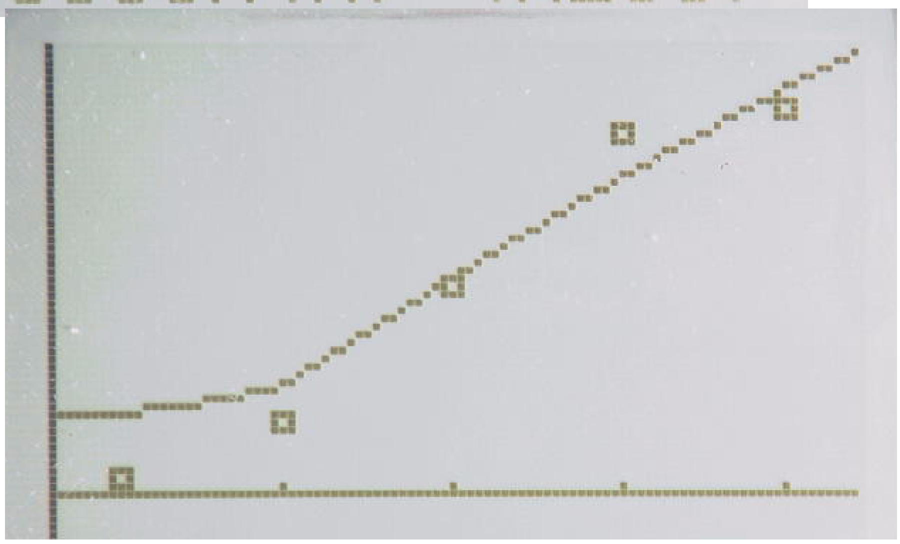


$Y_2(11)-Y_1(11)$ =14574.46...

Plot1 Plot2 Plot3

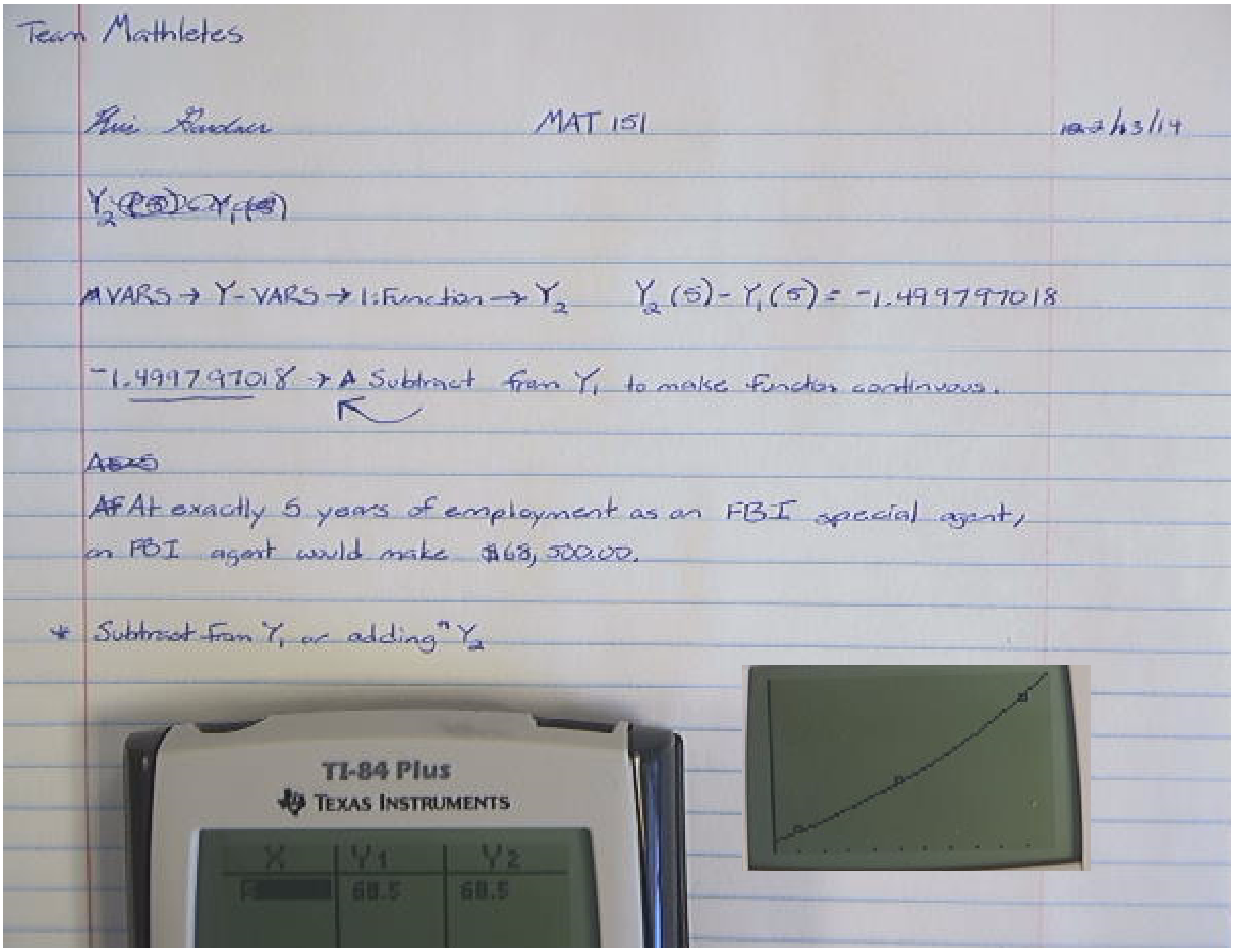
\Y1=.96129924517059*2.3676061244206^X/(X≤11)+14574.46729

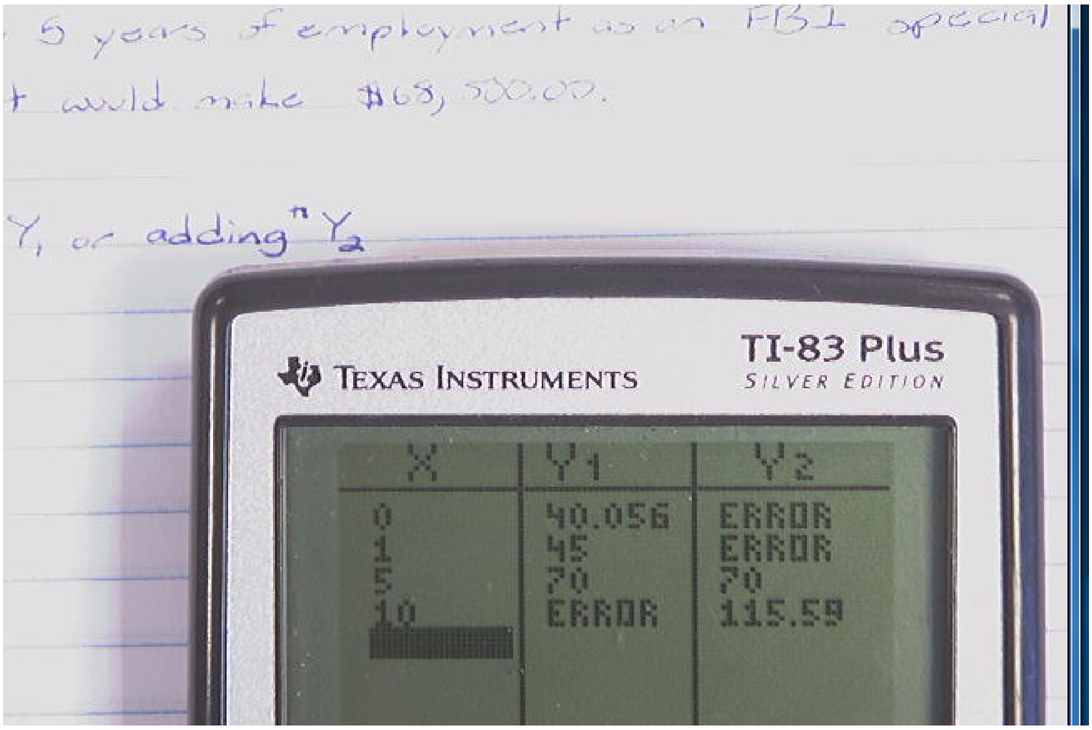
\Y2=-717189.18888321+310422.44977583ln(X)/(X≥11)

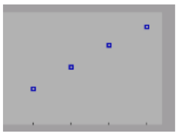


What is f(11) =

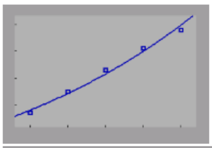
10	19895	ERROR
11	27171	27171
12	ERROR	54182


Team Mathletes
[illegible] MAT 151 12/3/14
VARS → Y-VARS → 1:Function → Y2   Y2(5) - Y1(5) = ⁻1.499797018
⁻1.499797018 → A Subtract from Y1 to make function continuous.
At exactly 5 years of employment as an FBI special agent, an FBI agent would make $68,500.00.
* Subtract from Y1 or adding Y2
TI-84 Plus
Texas Instruments
X Y1 Y2
68.5 68.5


5 years of employment as an FBI special
t would make $68,500.00.
Y1 or adding Y2
Texas Instruments
TI-83 Plus
Silver Edition
X Y1 Y2
0 40.056 ERROR
1 45 ERROR
5 70 70
10 ERROR 115.59

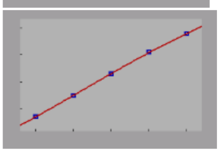


ExpReg
y=a*b^x
a=1.312342647
b=1.164322178
r²=.9881140124
r=.9940392409



X	Y1
5	2.8081
10	6.0087
11.5	7.549
11.7	7.7822
12	8.1456

Logistic
y=c/(1+ae^(-bx))
a=17.26455086
b=.3417641063
c=9.53927036



X	Y2
5	2.3118
10	6.0911
11.5	7.124
11.7	7.2452
12	7.419

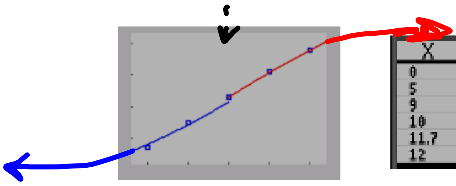
Inner

$\lim_{x \to 9^-} y_1 = 5.16..$

$\lim_{x \to 9^+} y_2 = 5.30...$

decade v world population

Split Regressions

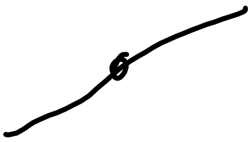


X	Y1	Y2
0	1.3123	ERROR
5	2.8081	ERROR
9	5.1607	5.3092
10	ERROR	6.0911
11.7	ERROR	7.2452
12	ERROR	7.419

Outer

$\lim_{x \to \infty} y_2 = 9.53...$

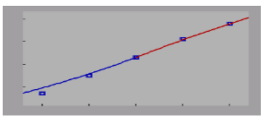
$\lim_{x \to -\infty} y_1 = 0$



Continuous

$\lim_{x \to 9} S(x) = 5.30$

Limits of Continuous Functions



X	Y1	Y2
0	1.4608	ERROR
5	2.9566	ERROR
9	5.3092	5.3092
10	ERROR	6.0911
11.7	ERROR	7.2452
12	ERROR	7.419

According to the continuous regression above, as we approach 1990, we expect world populatioin to be 5.3 billion