



ALGEBRA II ACTIVITY 6: FINITE DIFFERENCES

Tlgebra.com

ACTIVITY OVERVIEW:

In this activity we will

- Analyze differences in a set of data to determine the degree of the polynomial that will fit the data
- Copy lists and use the “change in list” command to analyze change
- Set up and examine scatter plots to determine the degree of the polynomial that will fit the data

```

2001 CALC TESTS
1:Edit...
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor
  
```

Press **STAT****ENTER**. Enter the six pairs of data as shown.

L1	L2	L3	2
0	-3		
-1	-2		
1	6		
4	13		
5	22		
6	33		

L2(7) = 33

Set up a scatter plot of the data. Press **2nd****Y=**.

```

5001 PLOTS
1:Plot1...Off
  [L1] L2 [ ]
2:Plot2...Off
  [L1] L2 [ ]
3:Plot3...Off
  [L1] L2 [ ]
4↓PlotsOff
  
```

Press **ENTER** to select **1: Plot 1**. register. Press **ENTER** to turn the plot **On**. Select the “dot” to represent the points.

```

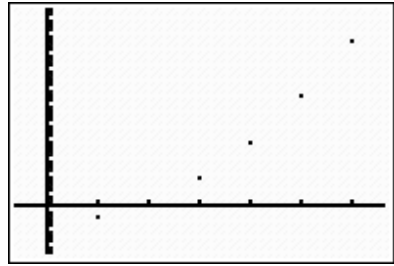
2001 Plot2 Plot3
0: Off
Type: [ ] [ ] [ ]
      [ ] [ ] [ ]
Xlist:L1
Ylist:L2
Mark: [ ] [ ] [ ]
  
```

Press **ZOOM****9**.

```

2001 MEMORY
3:Zoom Out
4:ZDecimal
5:ZSquare
6:ZStandard
7:ZTrig
8:ZInteger
9:ZoomStat
  
```

What type of function do you think will match this data?



Press **STAT** **ENTER**. Arrow to the top (title) of **L3**. Press **2nd** **1** **ENTER**. This will place the **L1** values into **L3**.

L1	L2	3
0	-3	-----
1	-2	
4	-1	
9	0	
16	1	
25	2	
36	3	

L3 = L1

Press **DEL** to remove the first value in the list.

L1	L2	L3	3
0	-3		
1	-2		
4	-1		
9	0		
16	1		
25	2		
36	3		

L3(1)=1

Arrow to the top (title) of **L4**.

L2	L3	4
-3	1	-----
-2	2	
-1	3	
0	4	
1	5	
2	6	
3	7	

L4 =

Press **2nd** **STAT** **7** to select **7: ΔList**. This will paste the command into the statistics screen.

```

NAMES  MATH
1:SortA(
2:SortD(
3:dim(
4:Fill(
5:seq(
6:cumSum(
 ΔList(
    
```

Press **2nd** **2** **0**. This tells the calculator to find the changes between values in **L2** and place them into **L4**.

L2	L3	4
-3	1	-----
-2	2	
-1	3	
0	4	
1	5	
2	6	
3	7	

L4 = ΔList(L2)

Press **ENTER** to execute.

L2	L3	L4	4
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	
10	10	10	
11	11	11	

L4(1)=1

Set up Plot 2 to plot the first differences (L4) against the L3, which is the original Xlist less the first entry. Select the “+” as the mark.

Plot1 **Off** Plot3

Off Off

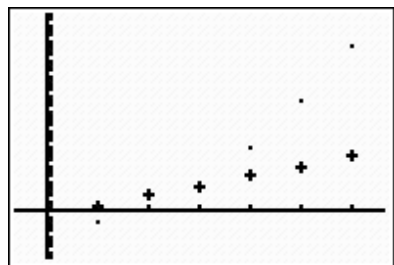
Type: **+**

Xlist: L3

Ylist: L4

Mark: **+**

Press **ZOOM****9**. Examine the shape of this graph. What does it tell you about the first differences?



Press **STAT****ENTER**. Arrow to the top (title) of L5. Press **2nd****3****ENTER**. This will place the L3 values into L5.

L3	L4	L5	5
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	
10	10	10	
11	11	11	

L5 = L3

Press **DEL** to remove the first value in the list.

L3	L4	L5	5
1	1	2	
2	2	3	
3	3	4	
4	4	5	
5	5	6	
6	6	7	
7	7	8	
8	8	9	
9	9	10	
10	10	11	

L5(1)=2

Arrow to the top (title) of L6. Press **2nd****STAT****7** to select **7: ΔList**. Press **2nd****4****ENTER**. This tells the calculator to find the changes between values in L4 and place them into L6.

L4	L5	L6	6
1	2	1	
2	3	1	
3	4	1	
4	5	1	
5	6	1	
6	7	1	
7	8	1	
8	9	1	
9	10	1	
10	11	1	

L6 = ΔList(L4)

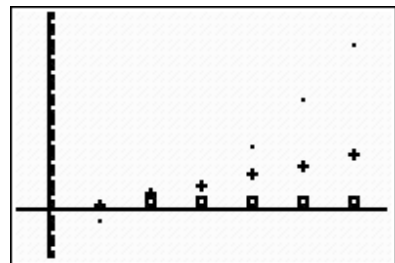
Press **ENTER** to execute.

L4	L5	L6	6
1	2	2	
1	3	5	
1	4	8	
1	5	11	
-----	-----	-----	
L6(1)=2			

Set up Plot 3 to plot the second differences (L6) against the L1, which is the original Xlist less the first two entries. Select the "box" as the mark.

Plot1	Plot2	Plot3
On	Off	On
Type: []	Type: []	Type: []
Xlist: L5	Xlist: L5	Xlist: L5
Ylist: L6	Ylist: L6	Ylist: L6
Mark: []	Mark: []	Mark: []

Press **ZOOM**[9]. Examine the shape of this graph. What does it tell you about the second differences?



Since the second differences were constant, we can determine that the data is quadratic. Run a quadratic regression. Press **STAT**[5] to paste the **QuadReg** command on the home screen.

EDIT	TESTS
1: 1-Var Stats	
2: 2-Var Stats	
3: Med-Med	
4: LinReg(ax+b)	
5: QuadReg	
6: CubicReg	
7: QuartReg	

Press **2nd**[1], **2nd**[2], **VAR**[1], **1** to tell the calculator to run a regress on L1 and L2 and place the results into Y1. Press **ENTER** to execute.

QuadReg	L1, L2, Y1
[]	

Press $\boxed{Y=}$ to view the equation.

Y1	Y2	Y3
$1X^2+0X-3$		

Press $\boxed{\text{GRAPH}}$ to see the equation graph through the original scatter plot.

