

Chapter 7 / Example 14

Exponential modelling

A rock band the VJs published a new video on their YouTube channel. The weekly views up to and including the 20th week of publication were as follows:

Week	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Views	102 365	38 716	21 617	24 305	9 321	14 148	2 103	8 285	5 098	3 777
Week	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th
Views	831	1007	834	34	378	204	6	42	54	31

- Explain why an exponential model would be suitable to model this set of data.
- Use exponential regression to determine the best fit exponential model.
- Determine R^2 the coefficient of determination of the model function.
- Sketch a graph showing the data points with the model function.
- For their next video, the band wants to start advertising it as soon as it falls below 1000 views per week. Assuming it follows the same pattern as the first video, predict after how many days they should do so.

Open a new document and add a Lists & Spreadsheet page.

Type 'x' in the first cell.

Enter the x-coordinates in the first column.

Press **enter** or **▼** after each number to move to the next cell.

Note: 'x' is a label that will be used to calculate the regression equation. You can use any letter or name to label the list.

A	B	C	D
1			
2			
3			
4			
5			

Type 'y' in the cell to the right of 'x'.

Enter the y-coordinates in the second column.

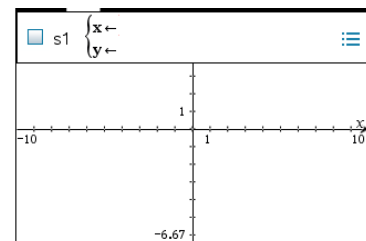
Use the **▲ ▼ ► ◀** keys on the touchpad to navigate the spreadsheet.

A	B	C	D
1	102365		
2	38716		
3	21617		
4	24305		
5	9321		

Add a new Graphs page to your document by pressing **ctrl** **doc** (**⌘** **page**) 2: Add Graphs.

Press **menu** 3: Graph Entry/Edit | 6: Scatter Plot.

The entry line is shown at the top of the work area.



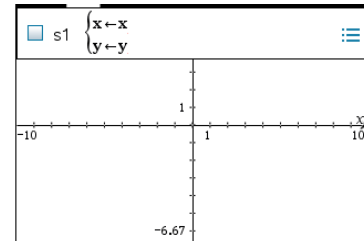
Chapter 7 / Example 14

Exponential modelling

Type the names of the two variables you created in the spreadsheet: 'x' and 'y'.

You can also select these from the dropdown list by pressing **var**.

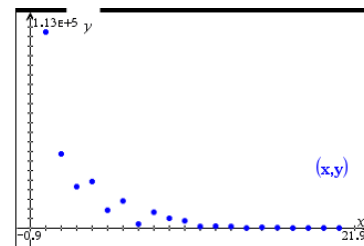
Press **enter**.



To view the data with suitable axes, press **menu** 4:Window/Zoom | 9:Zoom – Data.

The GDC displays a scatter diagram of x against y.

Because the data is approximately exponential, exponential regression is appropriate.



Return to the Lists & Spreadsheet page by pressing **ctrl** **del**.

To calculate the equation of quadratic regression

Press **menu** 4:Statistics | 1:Stat Calculations | A:Exponential Regression...

Open the drop down lists with **▶** and select using **▼** and **enter**.

Choose 'x' for X List, 'y' for Y List, f1 for Save RegEqn to and leave the remaining fields unchanged.

Click the touchpad on OK or press **enter** **del**.

The exponential curve is given by the equation

$$y = 129\,000 \times 0.642^x.$$

The coefficient of determination is $R^2 = 0.888$, which shows strong exponential association.

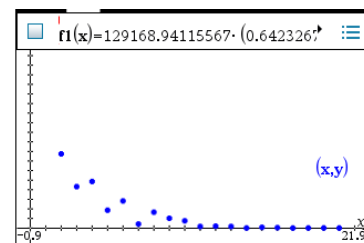
A	x	B	y	C	D
=					=ExpReg
1	1	102365	Title	Exponen..	
2	2	38716	RegEqn	a*b^x	
3	3	21617	a	129169.	
4	4	24305	b	0.642327	
5	5	9321	r^2	0.888002	
D1="Exponential Regression"					

Return to the Graph page by pressing **ctrl** **del**.

Press **tab** to display the entry line again.

Press **menu** 3:Graph Entry/Edit | 1:Function.

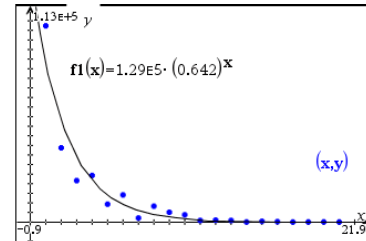
This time 'f2(x)= ' is displayed. Press **▲** to display 'f1(x)' and press **enter** to select it.



Chapter 7 / Example 14

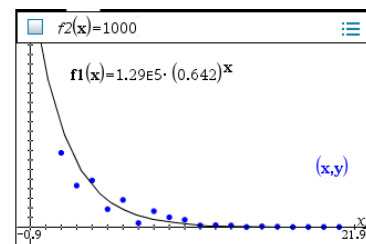
Exponential modelling

The GDC displays the scatter diagram and the regression line.

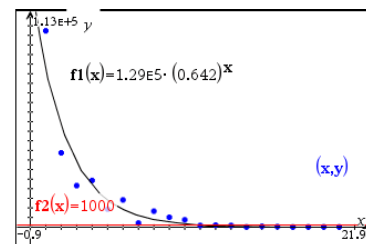


Press **tab** to display the entry line again. This time 'f2(x)= ' is displayed.

Type 1000 and press **enter**.



The GDC displays $f1(x) = 129\,000 \times 0.642^x$ and $f2(x) = 1000$. To see the intersection, you will need to change the window.



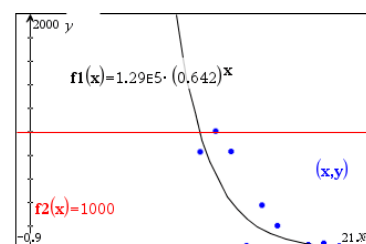
Press **menu** 4:Window/Zoom | 1:Window Settings...

Set the axes to show $0 \leq y \leq 2000$ with a scale of 200, leaving the remaining items the same.

Press **enter** when you have finished.

The 'Window Settings' dialog box is shown. The settings are: XMin: -0.9, XMax: 21.9, XScale: Auto, YMin: 0, YMax: 2000, YScale: 200. The 'OK' and 'Cancel' buttons are at the bottom.

The GDC now shows the regression curve and the portion of the scatter diagram in the region of the intersection.



Chapter 7 / Example 14

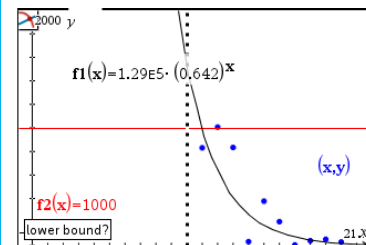
Exponential modelling

Press **menu** 6:Analyse Graph | 4:Intersection.

To find the intersection you need to give the lower and upper bounds of the region that includes the intersection.

The GDC shows a line and asks you to set the lower bound. Move the line using the touchpad and choose a position to the left of the intersection.

Click the touchpad.

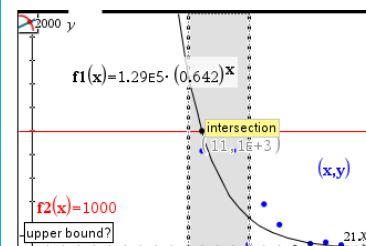


The GDC shows another line and asks you to set the upper bound.

Use the touchpad to move the line so that the region between the lower and upper bounds contains the intersection.

When the region contains the intersection, the calculator will display the word 'intersection' in a box.

Click the touchpad.



The GDC displays the intersection of the two straight lines at the point $(10.98, 1000)$.

$x = 10.98$ weeks = 76.9 days.

They have to start advertising their video again after 77 days.

