

Chapter 9 / **Example 6**

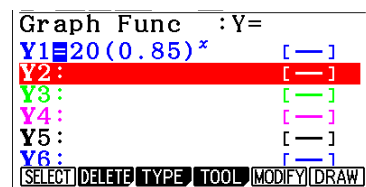
Solving exponential equations

The value of a boat, y , in thousands of UK pounds (£) is modelled by the function $y = 20(0.85)^x$, where x is the number of years since the boat was manufactured.

- Find the value of the boat when it was brand new.
- Estimate the value of the boat when it is 3 years old. Give your answer to the nearest pound.
- Use your GDC to estimate when the value of the boat will be worth half its original value.

Press **MENU** 5 **GRAPH** to display the equation entry screen.

Type $20(0.85)^x$ and press **EXE** to enter the equation as Y1.

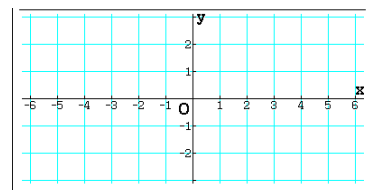


Press **F6** DRAW to display the graph screen

The GDC now displays the quadratic function:

$$Y1 = 20(0.85)^x$$

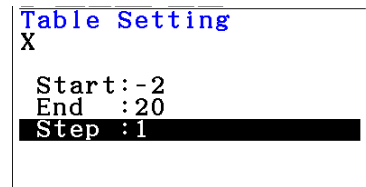
With the default axes no graph is visible.



To view values of the function it is helpful to use a table of values.

Press **MENU** 7 **TABLE**. Press **F5** SET and change the settings so that the table starts from -2 and ends at 20.

Press **EXIT**.

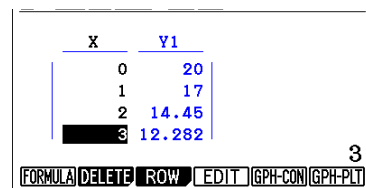


Press **F6** TABLE.

A table of values is displayed.

You can scroll through the table using **▲** and **▼**.

From the table, you can see that the graph can see that $f(0) = 20$ and $f(3) = 12.3$.



x	Y1
0	20
1	17
2	14.45
3	12.282

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Use this information to choose suitable window settings to display the graph.

Press **MENU** 5 **GRAPH**

Press **SHIFT** **F3** V-WIN.

Set the axes to show $-2 \leq x \leq 14$ and $-2 \leq y \leq 22$ and set both the scales set to 2.

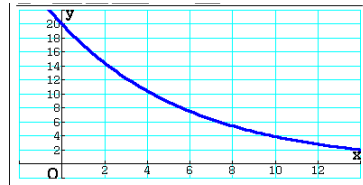
You can leave the other items as they are.

Press **EXIT** when you have finished.

View Window
 Xmin : -2
 max : 14
 scale: 2
 dot : 0.04232804
 Ymin : -2
 max : 22
 [INITIAL] [TRIG] [STANDARD] [V-MEM] [SQUARE]

Press **F6** DRAW to display the graph screen

The GDC displays the curve $Y_1 = 20(0.85)^x$ in a suitable window.



The value of the boat will have halved when it is £10 thousand.

Plot the line $y = 10$ on the same graph to find the intersection.

Press **EXIT** to display the equation entry screen.

Type 10 and press **EXE** to enter the equation as Y2.

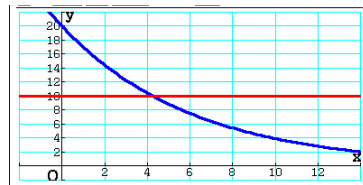
Graph Func : Y=
 Y1=20(0.85)^x [—]
 Y2=10 [—]
 Y3: [—]
 Y4: [—]
 Y5: [—]
 Y6: [—]
 [SELECT] [DELETE] [TYPE] [TOOL] [MODIFY] [DRAW]

Press **F6** DRAW to display the graph screen.

The GDC now displays the curve and the straight line:

$$Y_1 = 20(0.85)^x$$

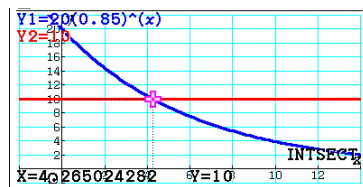
$$Y_2 = 10$$



To find the intersection press **F5** G-Solv **F5** INTSECT.

Press **EXE** to display the coordinates.

Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.



The GDC displays the intersection at the point $(4.27, 10)$.

The boat will be worth half its original value in approximately 4.27 years.

