

Chapter 9 / **Example 5**

# Solving an exponential equation

Consider the function  $y = 2^x + 3$ .

- Find i the  $y$ -intercept ii the equation of the asymptote.
- State the domain and range of the function.
- Sketch the graph of the function, showing the asymptote as a dotted line.
- Using your GDC, solve the equation  $2^x + 3 = 2 + 3^{-x}$ .

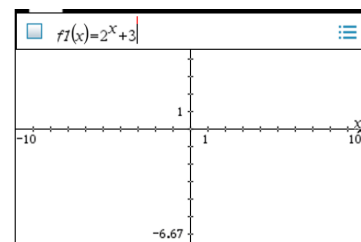
Open a new document and add a Graphs page.

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

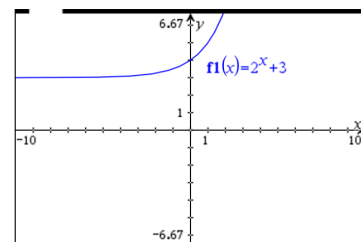
The default graph type is function, so ' $f1(x)=$ ' is displayed.

The default axes are  $-10 \leq x \leq 10$  and  $-6.67 \leq y \leq 6.67$ .

Type  $\boxed{2} \boxed{\wedge} \boxed{x} \boxed{+} \boxed{3}$  and press  $\boxed{\text{enter}}$ .



The GDC displays the curve  $f1(x) = 2^x + 3$



Change the window settings to view the function.

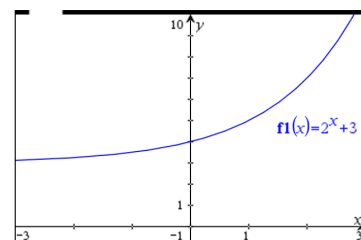
Press  $\boxed{\text{menu}}$  4:Window/Zoom | 1:Window Settings...

Set the axes to show  $-3 \leq x \leq 3$  and  $-1 \leq y \leq 10$

You can leave the scales set to Auto.

Press  $\boxed{\text{enter}}$  when you have finished.

The GDC displays the curve  $f1(x) = 2^x + 3$  in a suitable window.



Chapter 9 / **Example 5**

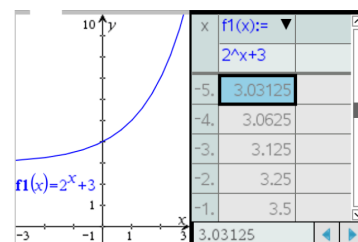
# Solving an exponential equation

To view asymptotic behavior, it is helpful to use a table of values. Press **ctrl** **T**.

A table of values is displayed alongside the graph.

Scroll up the table using **▲** on the touchpad.

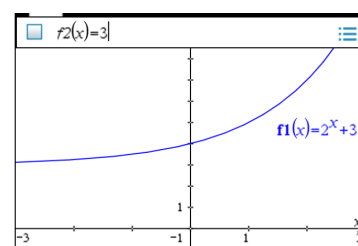
The values of  $f_1(x)$  approach 3 as  $x$  becomes smaller  
 $x = 3$  is a horizontal asymptote.



Press **ctrl** **T** again to remove the table.

Press **tab** to display the entry line again. This time ' $f_2(x)=$ ' is displayed.

Type 3 and press **enter**.



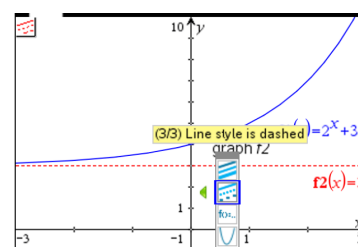
The GDC displays the line  $f_2(x) = 3$

Press **menu** 1:Actions | 4:Attributes

Use the touchpad to move the cursor to the line and click the touchpad.

Press **▼** to select Line style and **►►** to select 'dashed'.

Press **enter**.

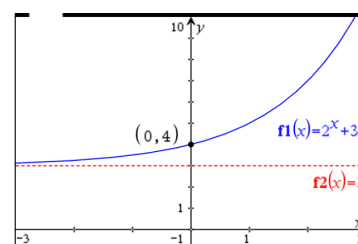


To find the  $y$ -intercept press **menu** 5:Trace | 1:Graph Trace

Press **0** **enter** to change the  $x$  coordinate to 0.

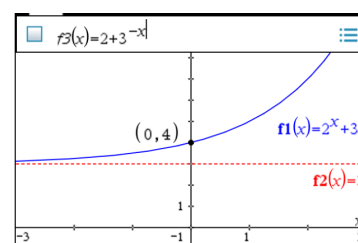
Press **enter** again and then press **esc** to leave the graph trace mode.

The GDC displays the coordinates of the  $y$ -intercept.



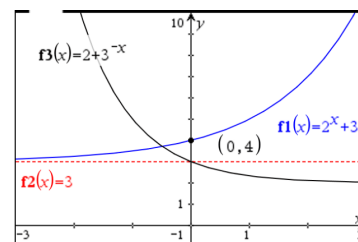
Press **tab** to display the entry line again. This time ' $f_3(x)=$ ' is displayed.

Type  $2 + 3^{-x}$  and press **enter**.



Chapter 9 / **Example 5****Solving an exponential equation**

The GDC displays the curve  $f_3(x) = 2 + 3^{-x}$ .



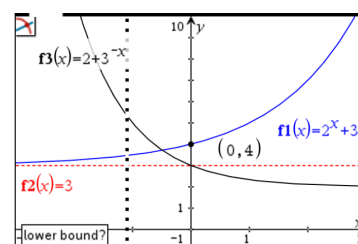
Press **menu** 6:Analyse Graph | 4:Intersection.

Use the touchpad to select  $f_1$  and  $f_3$ .

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.

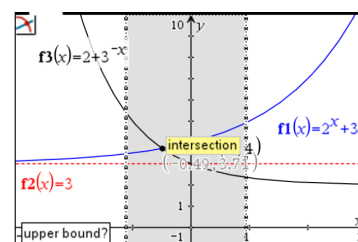


The GDC shows another line and asks you to set the upper bound.

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  $(-0.49, 3.71)$ .

The solution is  $x = -0.49$ .

