

Chapter 9 / **Example 5**

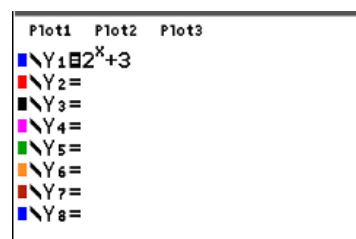
# Solving an exponential equation

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  $2^x + 3 = 2 + 3^{-x}$ .

Press  $[f1]$   $[y=]$  to display the equation entry screen.

Type  $2^x + 3$  and press  $[enter]$  to enter the equation as  $Y_1$ .

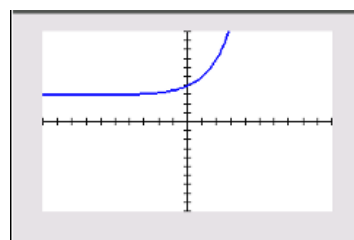


Press  $[f5]$   $[graph]$  to display the graph screen

The GDC now displays the quadratic function:

$$Y_1 = 2^x + 3$$

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

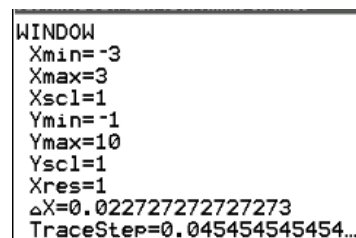


Press  $[f2]$   $[window]$

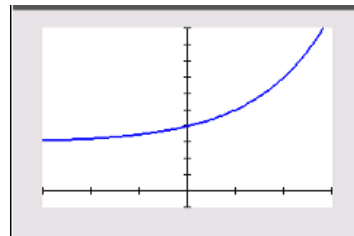
Set the axes to show  $-3 \leq x \leq 3$  and  $-1 \leq y \leq 10$

You can leave the scales set to 1.

Press  $[f5]$   $[graph]$  when you have finished.



The GDC displays the curve  $Y_1 = 2^x + 3$  in a suitable window.



To view asymptotic behavior, it is helpful to use a table of values.

Press  $[mode]$ . Use the  $\leftarrow$   $\uparrow$   $\rightarrow$   $\downarrow$  keys to place the cursor on GRAPH-TABLE in the Mode menu, and then press  $[enter]$  to highlight it.



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Press  $[f5]$   $[graph]$ .

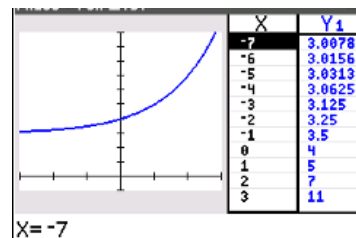
A table of values is displayed alongside the graph.

Press  $[2nd]$   $[f5]$   $[table]$  to move the cursor into the table.

You can scroll through the table using  $\uparrow$  and  $\downarrow$  on the touchpad.

The values of  $Y_1$  approach 3 as  $x$  becomes smaller.

$x = 3$  is a horizontal asymptote.



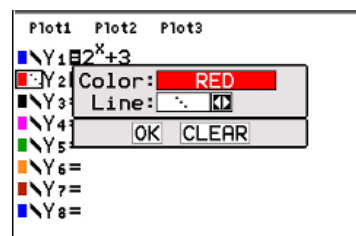
Return to a full graph display without the table.

Press  $[mode]$  Use the  $\leftarrow$   $\uparrow$   $\rightarrow$   $\downarrow$  keys to place the cursor on FULL in the Mode menu, and then press  $[enter]$  to highlight it.

Press  $[f1]$   $[y=]$  to display the equation entry screen.

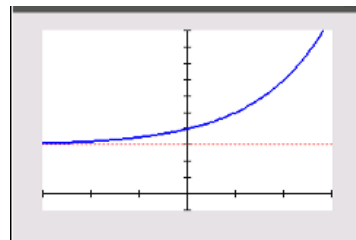
Type 3 and press  $[enter]$  to enter the equation  $y = 3$  as  $Y_2$ .

Use  $\leftarrow$  to move the cursor to the line at the left of the screen and press  $[enter]$ . Use  $\downarrow$  and  $\rightarrow$  to change the graph to the finest of the two dotted line settings. Press  $[enter]$  again (twice).



Press  $[f5]$   $[graph]$ .

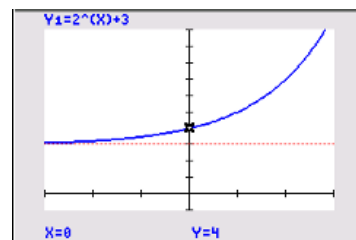
The GDC displays the curve  $Y_1 = 2^x + 3$  the dotted line  $F_2 = 3$ .



To find the y-intercept press  $[2nd]$   $[calc]$  1:value.

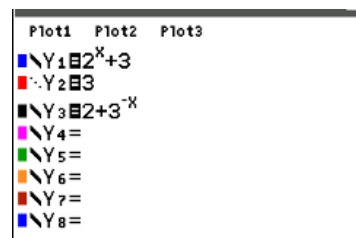
Press  $[0]$   $[enter]$  to change the x coordinate to 0.

The GDC displays the coordinates of the y-intercept (0,4).



Press  $[f1]$   $[y=]$  to display the equation entry screen.

Type  $2 + 3^{-x}$  and press  $[enter]$  to enter the equation as  $Y_3$ .

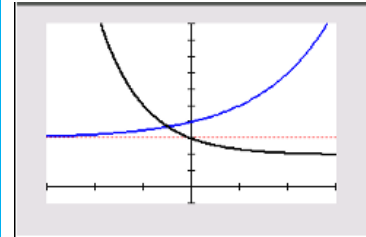


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# Solving an exponential equation

Press **[f5]** **[graph]**.

The GDC displays the line  $f3(x) = 2 + 3^{-x}$

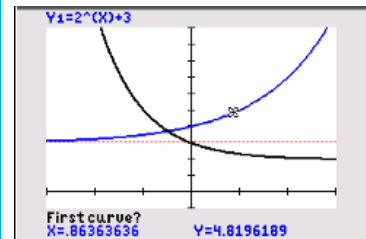


Press **[2nd]** **[f4]** **[calc]** 5:intersect.

To find the intersection you need to choose the two curves that intersect.

The GDC shows a cross on one of the curves and 'First curve?'.

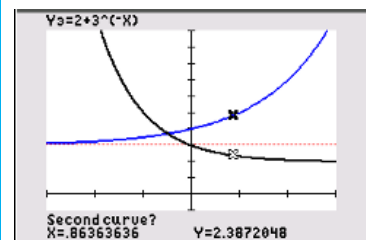
Press **[enter]**.



The GDC shows a cross on the line and 'Second curve?'.

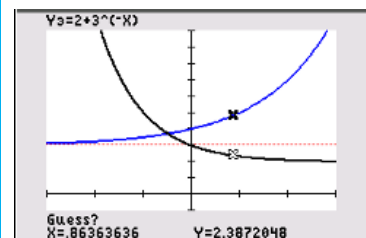
Use **[down arrow]** to select the curve  $f3(x)$

Press **[enter]**.



The GDC requires an initial guess for the position of the intersection. Choose the default position.

Press **[enter]**.



The GDC displays the intersection of the two curves at the point  $(-0.490, 3.71)$

The solution is  $x = -0.490$ .

