Chapter 9 / **Example 5**

Solving an exponential equation

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

a Find i the y-intercept ii the equation of the asymptote.

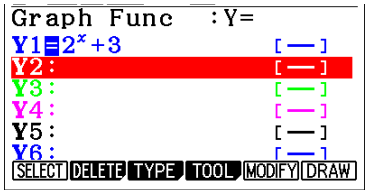
b State the domain and range of the function.

c Sketch the graph of the function, showing the asymptote as a dotted line.

d Using your GDC, solve the equation $2^x + 3 = 2 + 3^{-x}$.

Press MENU 5 GRAPH to display the equation entry screen.

Type $2^x + 3$ and press EXE to enter the equation as Y1.

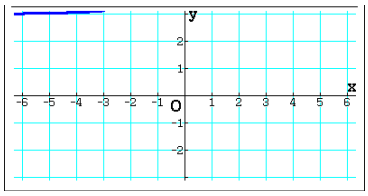


Press F6 DRAW to display the graph screen

The GDC now displays the quadratic function:

$Y1 = 2^x + 3$

The default axes are $-6.3 \le x \le 6.3$ and $-3.1 \le y \le 3.1$.

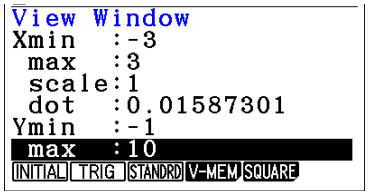


Press F3 V-WIN.

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

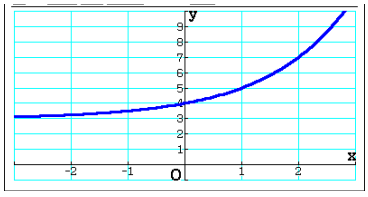
You can leave the other items as they are.

Press EXIT when you have finished.



Press F6 DRAW.

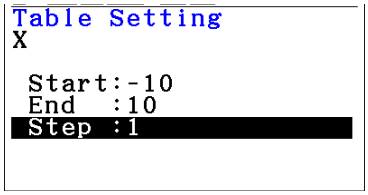
The GDC displays the curve $Y_1 = 2^x + 3$ in a suitable window.



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

Press MENU 7 TABLE. Press F5 SET and change the settings so that the table starts from −10 and ends at 10.

Press EXIT.



Chapter 9 / **Example 5**

Solving an exponential equation

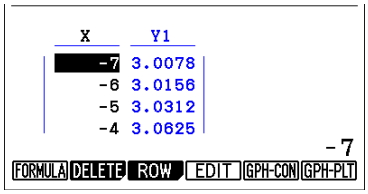
Press [F6] TABLE.

A table of values is displayed.

You can scroll through the table using ▲ and ▼.

The values of Y_1 approach 3 as x becomes smaller.

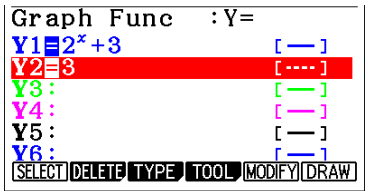
$x = 3$ is a horizontal asymptote.



Press [MENU] 5 [GRAPH] to display the equation entry screen.

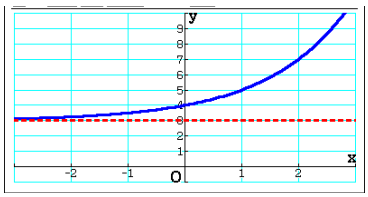
Type 3 and press [EXE] to enter the equation as Y2.

Press [F4] TOOL [F1] STYLE [F3] ------- and press [EXIT] twice.



Press [F6] DRAW to display the graph screen

The GDC now displays the curve $Y1 = 2^x + 3$ the dotted line $Y2 = 3$.

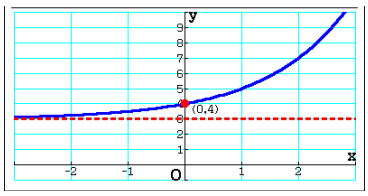


To find the y-intercept press [F5] G-SOLVE and then press [F4] Y-ICEPT

Press [EXE] to select Y1 and press [EXE] to display the coordinates.

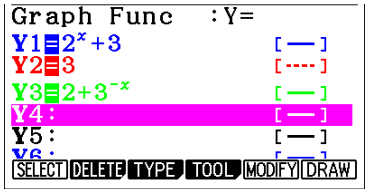
Press [EXIT] to leave G-Solv mode and [F6] DRAW to display the graph screen again.

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



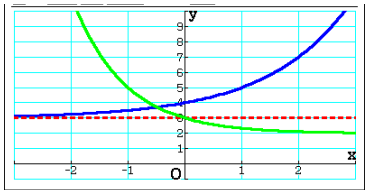
Press [EXIT] to display the equation entry screen.

Type $2 + 3^{-x}$ and press [EXE] to enter the equation as Y3.



Press [F6] DRAW to display the graph screen.

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



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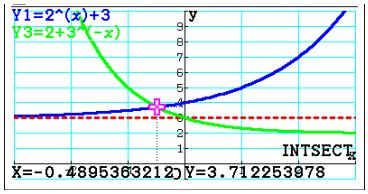
Solving an exponential equation

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

Press EXE to select Y1 and Y3 using ▼.

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 of the two curves at the point $(-0.490, 3.71)$

The solution is $x = -0.490$.