

Chapter 4 / **Example 1****Finding a limit with a graph and table**

Using your GDC,

**a** Sketch the graph of  $y = \frac{3^x - 1}{x}, x \neq 0$

**b** Find  $\lim_{x \rightarrow 0^-} \frac{3^x - 1}{x}$  and  $\lim_{x \rightarrow 0^+} \frac{3^x - 1}{x}$  numerically, giving your answer to 1 decimal place.

Open a new document and add a Graphs page.

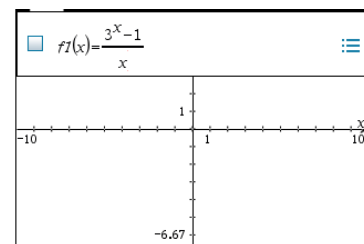
The entry line is displayed at the top of the work area.

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

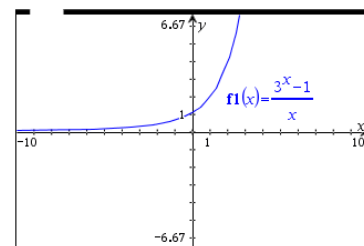
The default axes are  $-10 \leq x \leq 10$  and  $-6.67 \leq y \leq 6.67$ .

Press  $\boxed{\text{ctrl}}$   $\boxed{\frac{\square}{\square}}$  open the fraction template.

Type  $\frac{3^x - 1}{x}$  and press  $\boxed{\text{enter}}$ .

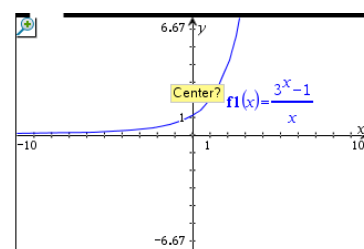


The GDC displays the graph  $f1(x) = \frac{3^x - 1}{x}$  with the default axes.

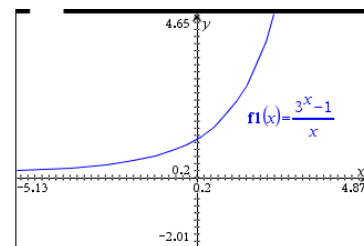


Press  $\boxed{\text{menu}}$  4:Window/Zoom | 3:Zoom - In

Use the trackpad to position the centre so that it is close to the y-intercept.



Even after zooming in the curve appears to be continuous at  $x = 0$ .

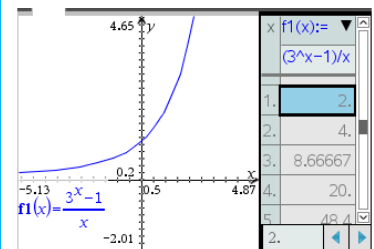


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## Finding a limit with a graph and table

To get a better idea of the behavior of the function close to  $x = 0$  press **ctrl** **T**.

A table of values is displayed alongside the graph.



Press **menu** 2:Table | 5:Edit Table Settings... and set Table Start to 0 and Table Step to 0.01.

Press **enter**.

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

When  $x = -0.01$ ,  $y = 1.092599...$

When  $x = 0.01$ ,  $y = 1.104669...$

There is an error at  $x = 0$

From the table, since the limits from both the left and right are the same to 1 d.p.,  $\lim_{x \rightarrow 0} \frac{3^x - 1}{x} \approx 1.1$ .

