

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

Using your GDC,

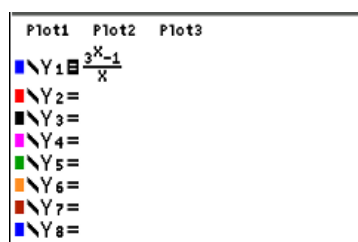
a Sketch the graph of $y = \frac{3^x - 1}{x}, x \neq 0$

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.

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

Press $[\text{ALPHA}]$ $[f1]$ 1:n/d to select the fraction template.

Type $\frac{3^x - 1}{x}$ and press $[\text{enter}]$ to enter the equation as Y_1 .

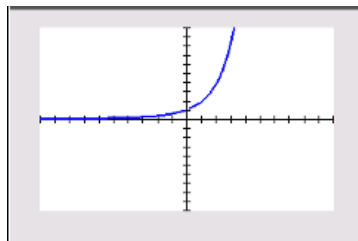


Press $[f5]$ $[\text{graph}]$ to display the graph screen.

The GDC now displays the quadratic function:

$$Y_1 = \frac{3^x - 1}{x}$$

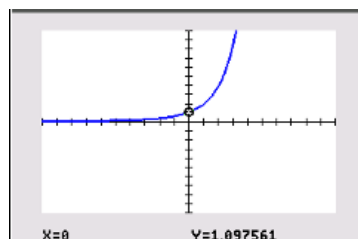
The default axes are $-10 \leq x \leq 10$ and $-10 \leq y \leq 10$.



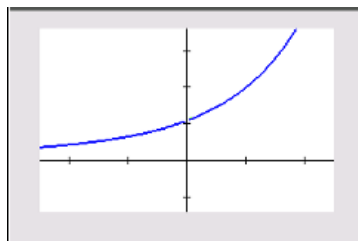
Press $[f3]$ $[\text{zoom}]$ 2:Zoom In

Select the center position using \uparrow \downarrow so that it is close to the y-intercept.

Press $[\text{enter}]$.



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



To get a better idea of the behavior of the function close to $x = 0$ you can use a table.

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

```
MATHPRINT CLASSIC
NORMAL SCI ENG
FLOAT 0 1 2 3 4 5 6 7 8 9
RADIAN DEGREE
FUNCTION PARAMETRIC POLAR SEQ
THICK DOT-THICK THIN DOT-THIN
SEQUENCE SIMUL
REAL a+bi re^(θi)
FULL HORIZONTAL GRAPH-TABLE
FRACTION TYPE: D/D Un/d
ANSWERS: AUTO DEC FRAC-APPROX
GO TO 2ND FORMAT GRAPH: NO YES
STAT DIAGNOSTICS: OFF ON
STAT WIZARDS: ON OFF
SET CLOCK 11/13/18 7:13PM
```

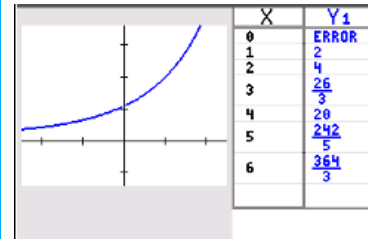
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Press $[f5]$ $[graph]$.

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 \blacktriangle and \blacktriangledown on the touchpad.



Press $[2nd]$ $[f2]$ $[tblset]$.

Set the table to start at 0 with ΔTbl set to 0.01

Press $[2nd]$ $[f5]$ $[table]$.

TABLE SETUP
 TblStart=0
 $\Delta Tbl=0.01$
 Indpnt: **Auto** Ask
 Depend: **Auto** Ask

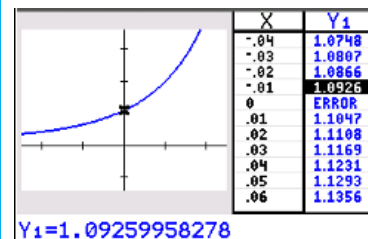
You can scroll through the table using \blacktriangle and \blacktriangledown on the touchpad.

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., $\lim_{x \rightarrow 0} \frac{3^x - 1}{x} \approx 1.1$.



$Y1=1.09259958278$