

Chapter 2 / **Example 8**

# Domain, range and asymptotes

Use of a table to assist in identifying asymptotes to find the domain and range of a function.

Determine the domain and range of the rational function  $y = \frac{2x-1}{1-3x}$ .

Confirm your answer graphically, and state the equations of any asymptotes.

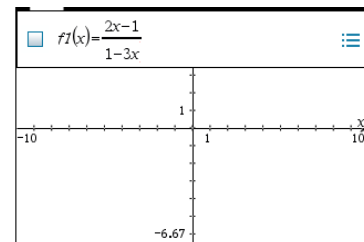
Open a new document and add a Graphs page.

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

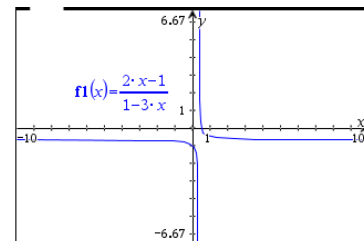
The default graph type is function, so 'f1(x)= ' is displayed.

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

Type  $\frac{2x-1}{1-3x}$ , using  $\boxed{\text{ctrl}} \boxed{\div}$  ( $\frac{\square}{\square}$ ) to enter the rational function, and press  $\boxed{\text{enter}}$ .



The GDC displays  $y = \frac{2x-1}{1-3x}$  in the default window.



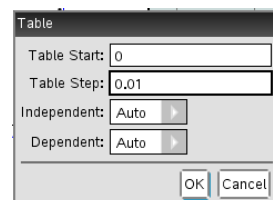
To view asymptotic behavior, it is helpful to use a table of values. Press  $\boxed{\text{ctrl}} \boxed{\text{T}}$ .

A table of values is displayed alongside the graph.

From the graph, there is a vertical asymptote between 0 and 1.

Press  $\boxed{\text{menu}} \text{ 2:Table | 5:Edit Table Settings...}$  and set Table Start to 0 and Table Step to 0.01.

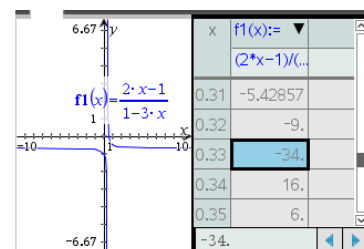
Press  $\boxed{\text{enter}}$ .



Scroll down the table using  $\blacktriangledown$  on the touchpad.

There is a change from decreasing negative values to increasing positive values between 0.33 and 0.34.

This supports the fact that  $x = \frac{1}{3}$  is a vertical asymptote.

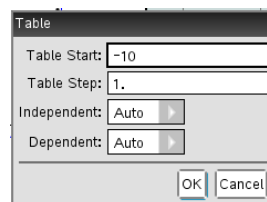


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To view behavior around the horizontal asymptote, change the table view.

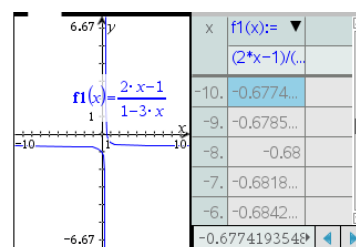
Press **menu** 2:Table | 5:Edit Table Settings... and set Table Start to -10 and Table Step to 1.

Press **enter**.



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

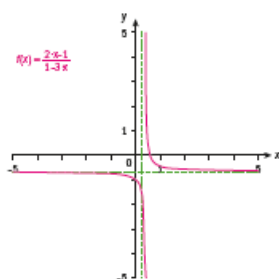
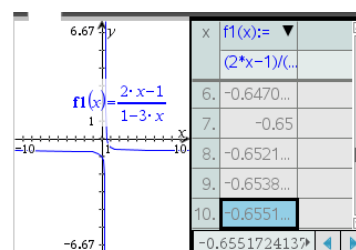
The values of  $f1(x)$  are approaching -0.677.



Scroll down the table using **▼** on the touchpad.

The values of  $f1(x)$  are approaching -0.655.

This supports the fact that  $y = -\frac{2}{3}$  is a horizontal asymptote.



Domain:  $x \in \mathbb{R}, x \neq \frac{1}{3}$

Range:  $y \in \mathbb{R}, y \neq -\frac{2}{3}$