

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.

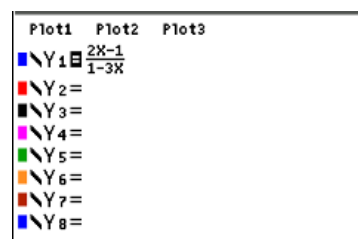
Determine the domain and range of the rational function  $y = \frac{2x-1}{1-3x}$ .

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

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

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

Type  $\frac{2x-1}{1-3x}$  and press  $[\text{enter}]$  to enter the equation as  $Y_1$ .

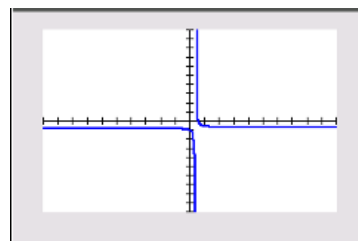


Press  $[f5]$   $[\text{graph}]$  to display the graph screen.

The GDC now displays the quadratic function:

$$Y_1 = \frac{2x-1}{1-3x}$$

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



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

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
SEQUENTIAL SIMUL
REAL a+bt re^(bt)
FULL HORIZONTAL GRAPH-TABLE
FRACTIONTYPE: n/d Unrd
ANSWERS: AUTO DEC FRAC-APPROX
GO TO 2ND FORMAT GRAPH: NO YES
STAT DIAGNOSTICS: OFF ON
STAT WIZARDS: ON OFF
SET CLOCK 11/10/18 10:06AM
```

Press  $[f5]$   $[\text{graph}]$ .

A table of values is displayed alongside the graph.

Press  $[2\text{nd}]$   $[f5]$   $[\text{table}]$  to move the cursor into the table.

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

Press  $[2\text{nd}]$   $[f2]$   $[\text{tblset}]$  and set TblStart to 0 and  $\Delta\text{Tbl}$  to 0.01

Press  $[f5]$   $[\text{graph}]$ .

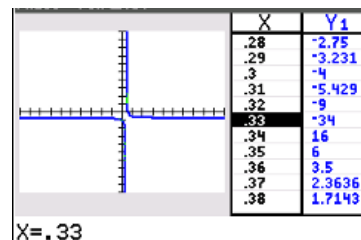
```
TABLE SETUP
TblStart=0
ΔTbl=.01
Indent: Auto Ask
Depend: Auto Ask
```

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

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

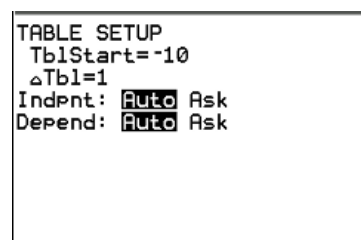
This supports the fact that  $x = \frac{1}{3}$  is a vertical asymptote.



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

Press  $\text{2nd}$   $\text{f2}$   $\text{[tblset]}$  and set TblStart to -10 and  $\Delta\text{Tbl}$  to 1.

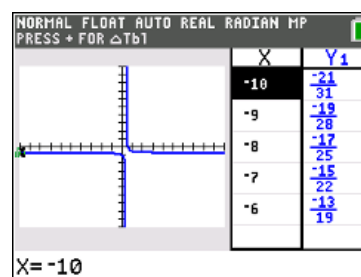
Press  $\text{f5}$   $\text{[graph]}$ .



Press  $\text{2nd}$   $\text{f5}$   $\text{[table]}$  to move the cursor into the table.

Scroll up the table using  $\blacktriangle$ .

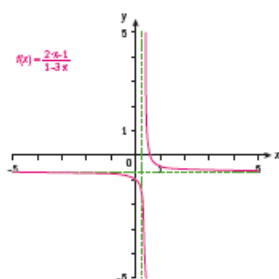
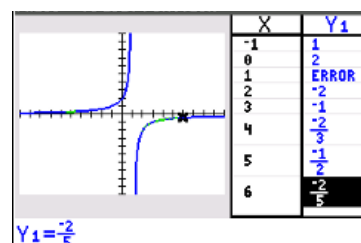
The values of  $Y_1$  are approaching  $-\frac{21}{31}$ .



Scroll down the table using  $\blacktriangledown$ .

The values of  $Y_1$  are approaching  $-\frac{19}{29}$ .

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



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

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

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