

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 **MENU** 5 **GRAPH** to display the equation entry screen.

Press **□** to open the fraction template

Type $\frac{2x-1}{1-3x}$ and press **EXE** to enter the equation as Y1.

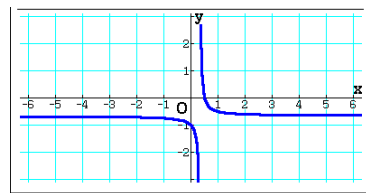
Graph Func : Y=
Y1: $\frac{2x-1}{1-3x}$ [—]
Y2: [—]
Y3: [—]
Y4: [—]
Y5: [—]
[SELECT] [DELETE] [TYPE] [TOOL] [MODIFY] [DRAW]

Press **F6** DRAW to display the graph screen

The GDC now displays the quadratic function:

$$Y1 = \frac{2x-1}{1-3x}$$

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



To view asymptotic behavior, it is helpful to use a table of values. From the graph, there is a vertical asymptote between 0 and 1.

Press **MENU** 7 **TABLE**. Press **F5** SET and change the settings so that the table starts from 0 and ends at 1 with a step of 0.01.

Press **EXIT**.

Table Setting
X
Start: 0
End : 1
Step : 0.01

Press **F6** TABLE.

A table of values is displayed.

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

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.

X	Y1
0.32	-9
0.33	-34
0.34	16
0.35	6

0.33

FORMULA DELETE ROW EDIT GPH-CON GPH-PLT

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

Press **EXIT**. Press **F5** SET and change the settings so that the table starts from -10 and ends at 10 with a step of 1. Press **EXIT**.

Table Setting
X
Start: -10
End : 10
Step : 1

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Press **F6** TABLE.

Scroll up the table using **▲**.

The values of Y1 are approaching -0.677.

$Y1=2 \div (1-x)$	
X	Y1
-6	0.2857
-5	0.3333
-4	0.4
-3	0.5

2 7
[FORMULA] [DELETE] [ROW] [EDIT] [GPH-CON] [GPH-PLT]

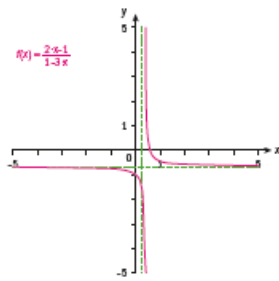
Scroll down the table using **▼**.

The values of Y1 are approaching -0.655.

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

$Y1=2 \div (1-x)$	
X	Y1
3	-1
4	-0.666
5	-0.5
6	-0.4

-2 5
[FORMULA] [DELETE] [ROW] [EDIT] [GPH-CON] [GPH-PLT]



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

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