

Chapter 2 / **Example 31****Graphing a function and its reciprocal**

Draw the graph of $y = x(x - 4)$. On the same set of axes, sketch the graph of its reciprocal, $y = \frac{1}{x(x - 4)}$. For both graphs, label any intercepts, zeros, extrema and asymptotes.

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

Type $x(x - 4)$ and press **EXE** to enter the first equation as Y1.

Type (, press **F1** Y, type 1), press **SHIFT**) x^{-1} and press **EXE** to enter the second equation as Y2.

Graph Func : Y=
 Y1 $x(x-4)$ [—]
 Y2 $(Y1)^{-1}$ [—]
 Y3: [—]
 Y4: [—]
 Y5: [—]
 Y6: [—]
SELECT **DELETE** **TYPE** **TOOL** **MODIFY** **DRAW**

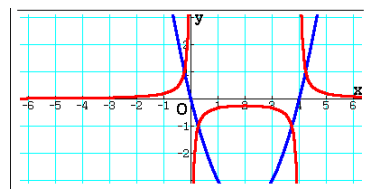
Press **F6** **DRAW** to display the graph screen

The GDC now displays the two functions:

$$Y1 = x(x - 4)$$

$$Y2 = \frac{1}{x(x - 4)}$$

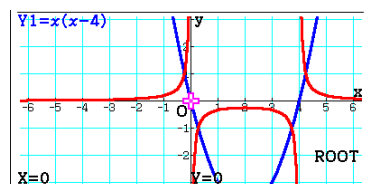
The default axes are $-6.3 \leq x \leq 6.3$ and $-3.1 \leq y \leq 3.1$.



To find the zeros of Y1 press **F5** **G-SOLVE** and then press **F1** **ROOT**.

Select Y1 and press **EXE**.

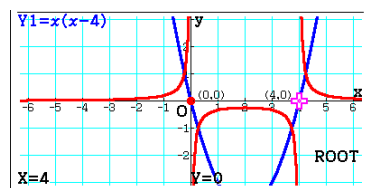
The GDC shows the first zero.



Press **EXE** to display the coordinates.

Press **▶** to move to the next zero and press **EXE** to display its coordinates.

Press **EXIT** to leave G-Solv mode and **F6** **DRAW** to display the graph screen again.



The GDC displays zeros at $(3,0)$ and $(12,0)$.



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

Press **MENU** 7 **TABLE**. Press **F5** SET and change the settings so that the table starts from -1 and ends at 5.

Press **EXIT**.

Table Setting

X

Start: -1

End : 5

Step : 1

Press **F6** TABLE.

A table of values is displayed.

The table shows 'ERROR' by $x = 0$.

This shows that $x = 0$ is a vertical asymptote.

X	Y1	Y2
0	0	ERROR
1	-3	-0.333
2	-4	-0.25
3	-3	-0.333

0

FORMULA DELETE ROW EDIT GPH-CON GPH-PLT

You can scroll down the table using **▼** **◀**.

The table shows 'ERROR' by $x = 4$.

This shows that $x = 4$ is a vertical asymptote.

This shows that $x = 0$ and $x = 4$ are vertical asymptotes of Y2 corresponding to the zeros of Y1.

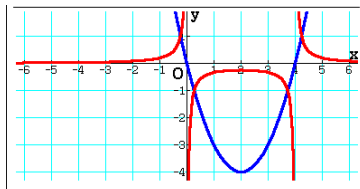
X	Y1	Y2
1	-3	-0.333
2	-4	-0.25
3	-3	-0.333
4	0	ERROR

4

FORMULA DELETE ROW EDIT GPH-CON GPH-PLT

Press **MENU** 5 **GRAPH** **F6** DRAW to return to the graph screen.

To find the minimum of Y1 press **▼** to show the minimum on the screen.

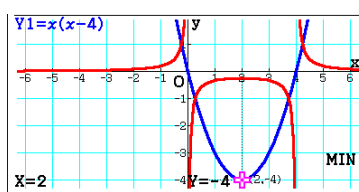


Press **F5** G-Solv **F3** MIN.

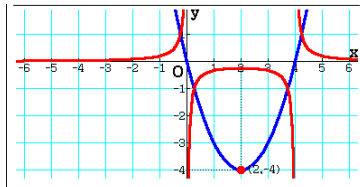
Select Y1 and press **EXE**.

Press **EXE** to display the coordinates.

Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.



The GDC displays the minimum at $(2, -4)$.



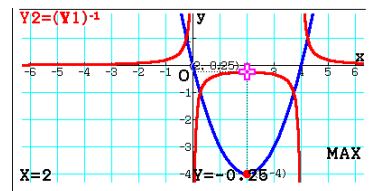
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To find the maximum of Y2 press **F5** G-Solv **F2** MAX.

Select Y2 using **▼** and press **EXE**.

Press **EXE** to display the coordinates.

Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.



The GDC displays the local maximum point at $(2, -0.25)$.

The maximum of Y2 corresponds to the minimum of Y1.

