

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

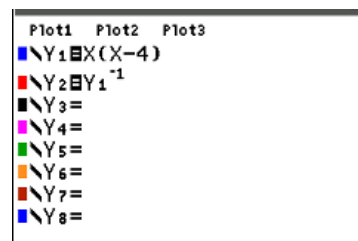
Draw the graph of $y = x(x - 4)$. On the same set of axes, sketch the graph of its reciprocal, $y = \frac{1}{x(x - 4)}$. For both graphs, label any intercepts, zeros, extrema and asymptotes.

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

Type $x(x - 4)$ and press $[enter]$ to enter the first equation as Y_1 .

Enter Y_1 by pressing $[X][X-4]$ $[f4]$ 1: Y_1 press $[x^{-1}]$ and press $[enter]$ to enter the second equation as Y_2 .

Use the fraction template by pressing $[ALPHA]$ $[f1]$ 1:n/d.



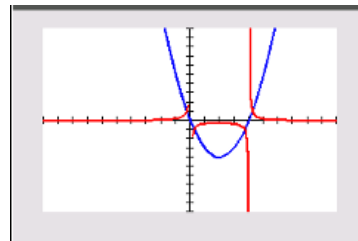
Press $[f5]$ $[graph]$ to display the graph screen

The GDC now displays both graphs:

$$Y_1 = x(x - 4)$$

$$Y_2 = \frac{1}{x(x - 4)}$$

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

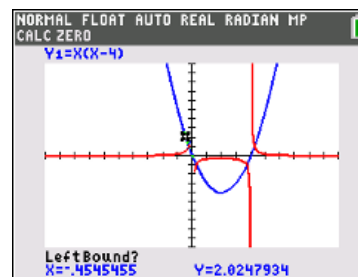


To find the zeros of Y_1 press $[2nd]$ $[f4]$ $[calc]$ 2:zero

You will need to give the left and right bounds of the region that includes the zero.

The GDC shows a point on the curve and asks you to set the left bound. Move the point using $[right arrow]$ $[left arrow]$ and choose a position to the left of the zero.

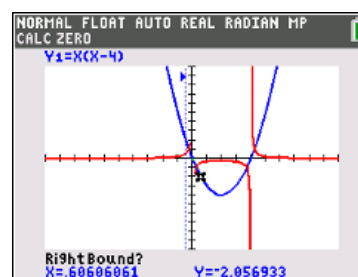
Press $[enter]$.



The GDC shows a line where you have set the left bound and a point on the curve.

Move the point using $[right arrow]$ $[left arrow]$ and choose a position to the right of the zero.

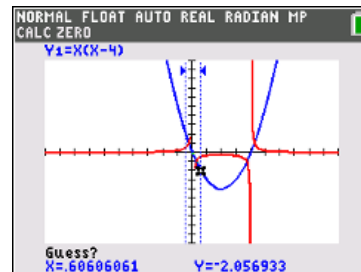
When the region contains the zero, Press $[enter]$.



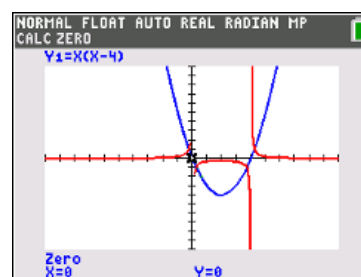
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The GDC requires an initial guess for the position of the zero.
Choose the default position.

Press **[enter]**.

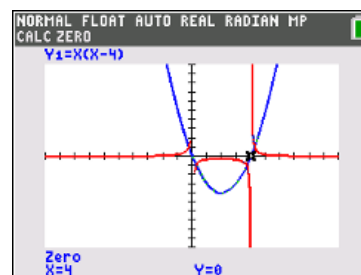


The GDC displays a zero at $(0,0)$.



Repeat for the second zero.

The GDC displays a zero at $(4,0)$.



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

Press **[mode]**. Use the **[left]**, **[up]**, **[right]**, **[down]** keys to place the cursor on GRAPH-TABLE in the Mode menu, and then press **[enter]** to highlight it.



Press **[f5]** **[graph]**.

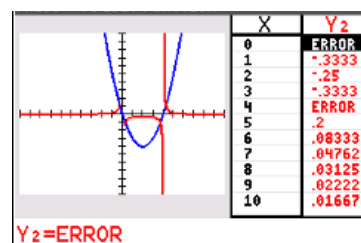
A table of values is displayed alongside the graph.

Press **[2nd]** **[f5]** **[table]** to move the cursor into the table.

Press **[right]** to move over to Y_2 .

The table shows 'ERROR' by $x = 0$ and $x = 4$.

This shows that $x = 0$ and $x = 4$ are vertical asymptotes of Y_2 corresponding to the zeros of Y_1 .



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Press **[mode]**. Use the **[↓]** **[↑]** **[→]** **[←]** keys to place the cursor on **FULL** in the Mode menu, and then press **[enter]** to highlight it.
Press **[f5]** **[graph]** when you have finished.



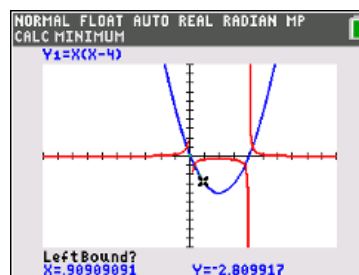
NORMAL FLOAT AUTO REAL RADIAN MP
SCREEN VIEW
MATHPRINT CLASSIC
NORMAL SCI ENG
FLOAT 0 1 2 3 4 5 6 7 8 9
RADIAN DEGREE
FUNCTION PARAMETRIC POLAR SEQ
THICK DOT-THICK THIN DOT-THIN
SEQUENTIAL SIMUL
REAL a+bi re^(θi)
FULL HORIZONTAL GRAPH-TABLE
FRACTION TYPE: n/d Unrd
ANSWERS: AUTO DEC FRAC-APPROX
GO TO 2ND FORMAT GRAPH: NO YES
STAT DIAGNOSTICS: OFF ON
SET CLOCKS: ON OFF
SET CLOCK 11/10/18 10:21PM

To find the minimum of Y_1 press **[2nd]** **[f4]** **[calc]** 3:minimum

You will need to give the left and right bounds of the region that includes the minimum.

The GDC shows a point on the curve and asks you to set the left bound. Move the point using **[→]** **[←]** and choose a position to the left of the turning point.

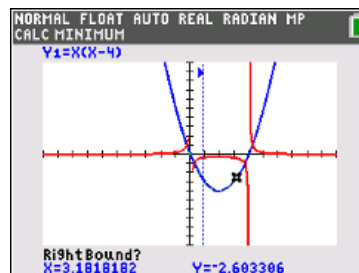
Press **[enter]**.



The GDC shows a line where you have set the left bound and a point on the curve.

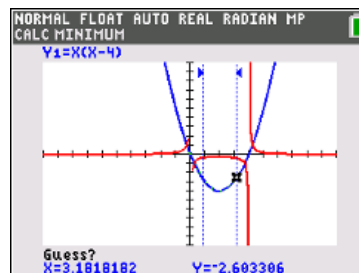
Move the point using **[→]** **[←]** and choose a position to the right of the turning point.

When the region contains the turning point, Press **[enter]**.



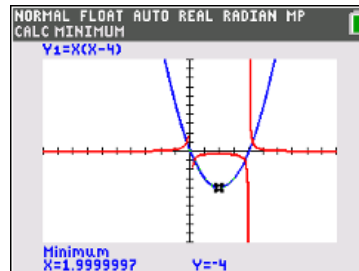
The GDC requires an initial guess for the position of the turning point. Choose the default position.

Press **[enter]**.



The GDC displays the minimum of Y_1 at (2,0).

Remember to round these very small differences.



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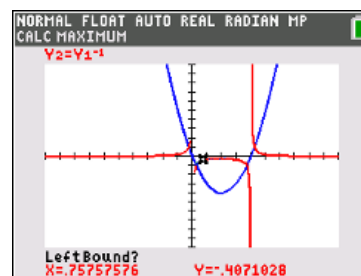
To find the maximum of Y_2 press **[2nd]** **[f4]** **[calc]** 4:maximum

Press **[▲]** to select Y_2 .

You will need to give the left and right bounds of the region that includes the maximum.

The GDC shows a point on the curve and asks you to set the left bound. Move the point using **[▶]** **[◀]** and choose a position to the left of the turning point.

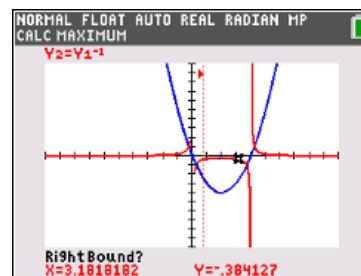
Press **[enter]**.



The GDC shows a line where you have set the left bound and a point on the curve.

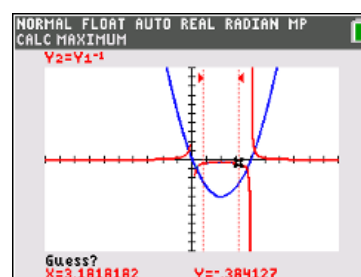
Move the point using **[▶]** **[◀]** and choose a position to the right of the turning point.

When the region contains the turning point, Press **[enter]**.



The GDC requires an initial guess for the position of the turning point. Choose the default position.

Press **[enter]**.



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

Remember to round these very small differences.

The maximum of Y_2 corresponds to the minimum of Y_1 .

