

Chapter 3 / **Example 20**

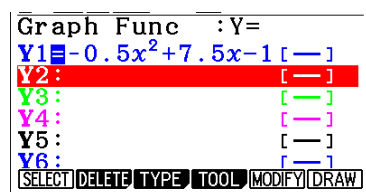
Graphing quadratic functions

This example includes the techniques of finding a suitable window to display the function and using the GDC to find its key features.

The quadratic function $f(x) = -0.5x^2 + 7.5x - 18$ is said to be in general form. Use technology to plot the graph of $f(x) = -0.5x^2 + 7.5x - 18$ and then sketch this on paper. Your sketch should show the general correct shape of the graph, with key features labeled. Also state the domain and range of this function.

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

Type $-0.5x^2 + 7.5x - 18$ and press **EXE** to enter the equation as Y1.

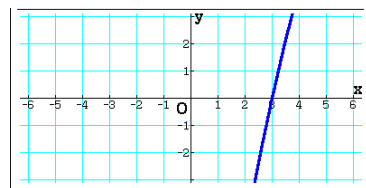


Press **F6** DRAW to display the graph screen

The GDC now displays the quadratic function:

$$Y_1 = -0.5x^2 + 7.5x - 18$$

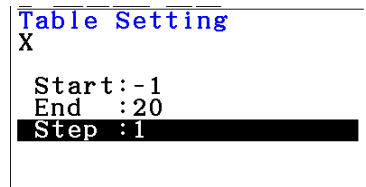
The default axes are $-6.3 \leq x \leq 6.3$ and $-3.1 \leq y \leq 3.1$.



To get a better idea of the best window to view the graph in, 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 20.

Press **EXIT**.



Press **F6** TABLE.

A table of values is displayed.

From the table, you can see that the curve will cross the y-axis at $(0, -18)$.

X	Y1
-1	-26
0	-18
1	-11
2	-5

-1

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You can scroll through the table using **▲** and **▼** to get an idea of the ranges of values you will need to use for x and y to display the curve.

X	Y1
6	9
7	10
8	10
9	9

6

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Use this information to choose suitable window settings to display the graph.

Press **MENU** 5 **GRAPH** **VIEW**

Press **SHIFT** **F3** V-WIN.

Set the axes to show $-6 \leq x \leq 20$ and $-20 \leq y \leq 15$

You can leave the other items as they are.

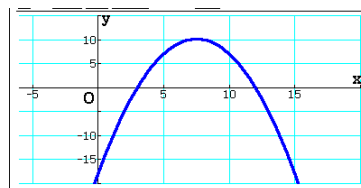
Press **EXIT** when you have finished.

View Window
 Xmin : -6
 max : 20
 scale : 5
 dot : 0.06878306
 Ymin : -20
 max : 15
 [INITIAL] [TRIG] [STANDARD] [V-MEM] [SQUARE]

Hint: press **EXE** after entering each value to move between the settings.

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

The GDC now displays the quadratic function $Y_1 = -0.5x^2 + 7.5x - 18$ in a suitable window.

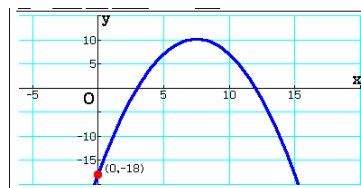


To find the y-intercept press **F5** G-SOLVE and then press **F4** Y-ICEPT

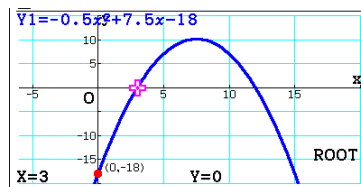
Press **EXE** to display the coordinates.

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

The GDC displays the coordinates of the y-intercept.



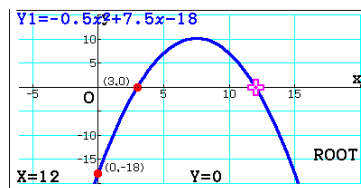
To find the zeros press **F5** G-SOLVE and then press **F1** ROOT.
 The GDC shows the first zero.



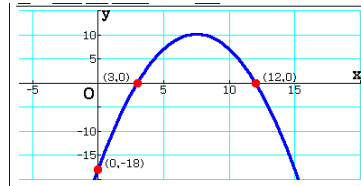
Press **EXE** to display the coordinates.

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 $(12, 0)$.

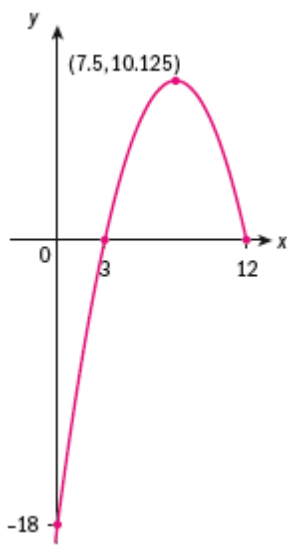
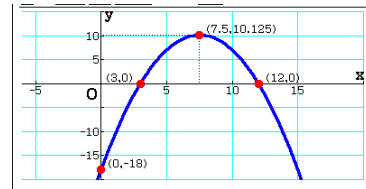


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To find the vertex press **F5** G-SOLVE and then press **F2** MAX
Press **EXE** to display the coordinates.

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

The GDC displays the vertex of the quadratic function at $(7.5, 10.125)$.



Domain of f is $\{x \in \mathbb{R}\}$.

Range of f is $\{y \in \mathbb{R} \mid y \leq 10.125\}$.