

Chapter 6 / **Example 9**

# Sketching cubic functions

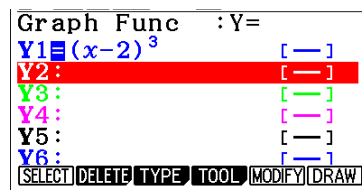
Sketch the graphs of  $y = f(x)$  for the following functions.

**a**  $f(x) = (x-2)^3$ ,  $0 \leq x \leq 4$       **b**  $f(x) = x^3 - 7x^2 + 4x - 12$ ,  $-2 \leq x \leq 8$

On your sketch, label the coordinates of points where the graphs intersect the axes, and any local maximum or minimum points.

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

Type  $(x-2)^3$  and press **EXE** to enter the equation as Y1.

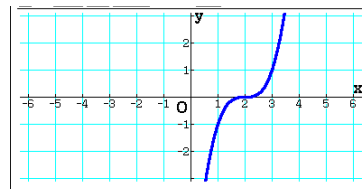


Press **F6** **DRAW** to display the graph screen

The GDC now displays the cubic function:

$$Y1 = (x-2)^3$$

The default axes are  $-6.3 \leq x \leq 6.3$  and  $-3.1 \leq y \leq 3.1$ . There is no maximum or minimum point.



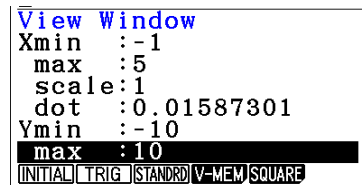
Change the window settings for a better view.

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

Set the axes to show  $-1 \leq x \leq 5$  with a scale of 1 and  $-10 \leq y \leq 10$  with a scale of 2.

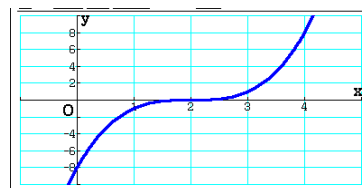
Leave everything else the same.

Press **EXIT** when you have finished.



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

The GDC displays the graph in a suitable window.

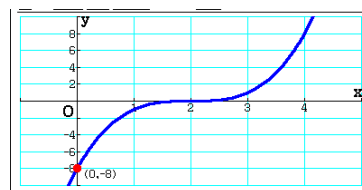


To find the y-intercept press **F5** **G-SOLVE** and then press **F4** **Y-ICEPT**.

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,  $(0, -8)$ .



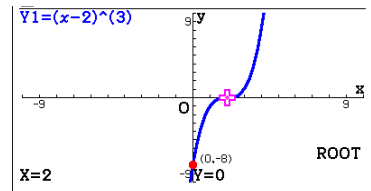
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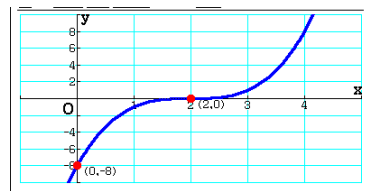
To find the zero press **F5** G-SOLVE and then press **F1** ROOT.  
The GDC shows the zero.

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 a zero at (2,0).



Press **MENU** 7 **TABLE** and press **F6** TABLE.

You can scroll through the table using **▲** and **▼**.  
Take some more points from the table and plot the graph.

X	Y1
1	-1
2	0
3	1
4	8

1

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

Press **EXIT** to display the equation entry screen.

Type  $x^3 - 7x^2 + 4x - 12$  and press **EXE** to enter the equation as Y1.

Graph Func : Y=

Y1:  $x^3 - 7x^2 + 4x - 12$  [—]

Y2: [—]

Y3: [—]

Y4: [—]

Y5: [—]

Y6: [—]

[SELECT] [DELETE] [TYPE] [TOOL] [MODIFY] [DRAW]

Press **MENU** 7 **TABLE**. Press **F5** SET and change the settings so that the table starts from -2 and ends at 8.

Press **EXIT**.

Table Setting

X

Start: -2

End: 8

Step: 1

Press **F6** TABLE.

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

From the table, suitable axes will be  $-2 \leq x \leq 8$  and  $-60 \leq y \leq 90$ .

X	Y1
-2	-56
-1	-24
0	-12
1	-14

-2

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

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

Press **MENU** 5 **GRAPH** and press **SHIFT** **F3** V-WIN.

Set the axes above with a x-scale of 1 and a y-scale of 20.

You can leave the other items as they are.

Press **EXIT** when you have finished.

View Window

Xmin: -2

max: 8

scale: 1

dot: 0.02645502

Ymin: -60

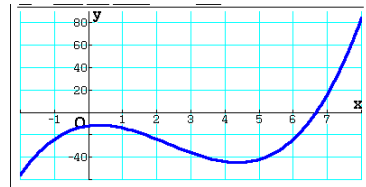
max: 90

[INITIAL] [TRIG] [STANDARD] [V-MEM] [SQUARE]

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Press **F6** DRAW to display the graph screen.  
The GDC displays the cubic curve in a suitable window.

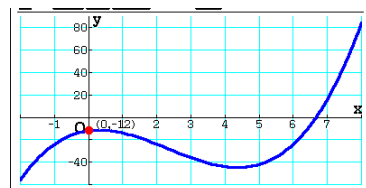


To find the y-intercept press **F5** G-SOLVE and then press **F4** Y-ICEPT.

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,  $(0, -12)$ .

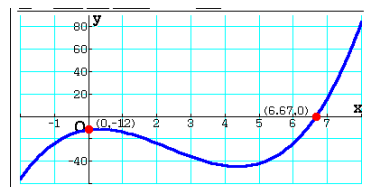


To find the zero press **F5** G-SOLVE and then press **F1** ROOT.  
The GDC shows the zero.

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 a zero at  $(6.67, 0)$ .



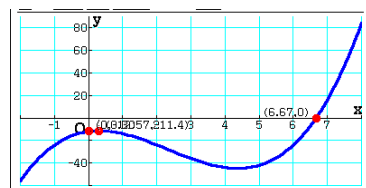
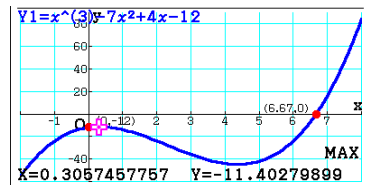
To find the maximum press **F5** G-Solv **F2** MAX.

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 maximum.

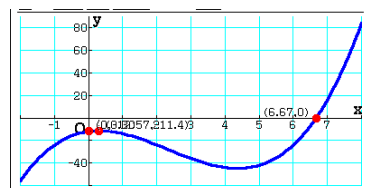
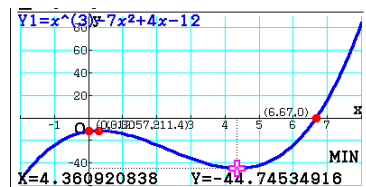
The maximum of the cubic function is at  $(0.306, -11.4)$ .



To find the minimum press **F5** G-Solv **F3** MIN.

Press **EXE** to display the coordinates.

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



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The GDC displays the minimum.

The minimum of the cubic function is at  $(4.36, -44.7)$ .

The four points found should be sufficient to sketch the curve.

