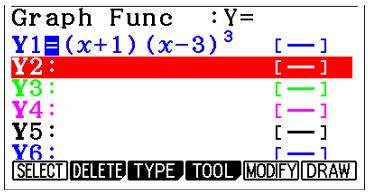
Chapter 4 / **Example 30**

Finding turning points and points of inflexion

Find any turning points and points of inflexion of $y=(x+1)(x-3)^3$ and justify your answers. Confirm your answers graphically.

Press MENU 5 to display the equation entry screen.

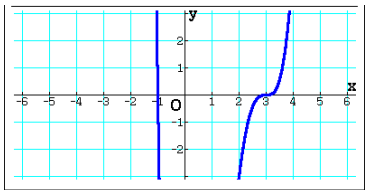
Type $(x+1)(x-3)^3$ and press EXE to enter the equation as Y1.



Press F6 DRAW to display the graph screen.

The GDC now displays the function $Y1=(x+1)(x-3)^3$

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



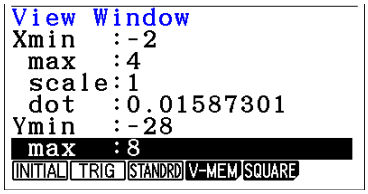
Change the window settings for a better view.

Press F3 V-WIN.

Set the axes to show $-2 \le x \le 4$ with a scale of 1 and $-28 \le y \le 8$ with a scale of 4.

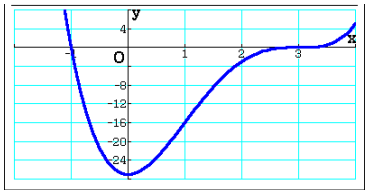
Leave everything else the same.

Press EXIT when you have finished.



Press F6 DRAW to display the graph screen.

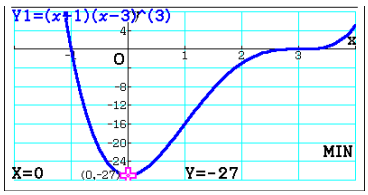
The GDC displays the graph in a suitable window.



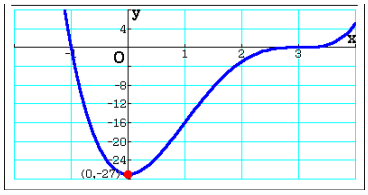
To find the minimum press F5 G-Solv F3 MIN.

Press EXE to display the coordinates.

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



The GDC displays the minimum at $(0,-27)$.



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Chapter 4 / **Example 30**

Finding turning points and points of inflexion

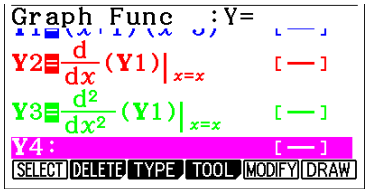
Consider the nature of the function in the region around the point $(3,0)$.

Plot the first and second derivative functions.

Press [EXIT] to display the equation entry screen.

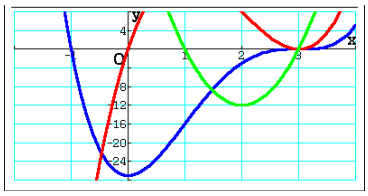
Press [OPTN] [F2] CALC [F1] d/dx then press [F1] Y and type 1. Then press [▶] and type X in the space in the template and press [EXE] to enter the derivative function as Y2.

Press [OPTN] [F2] CALC [F2] d^2/dx^2 then press [F1] Y and type 1. Then press [▶] and type X in the space in the template and press [EXE] to enter the derivative function as Y2.



Press [F6] DRAW to display the graph screen.

The GDC now displays the function and its first and second derivatives.

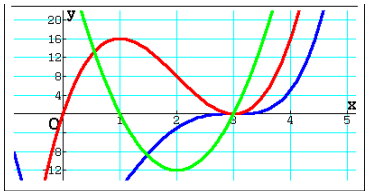


Use the [▶] [◀] [▲] [▼] keys to get a better view of the region around the point $(3,0)$.

At $(3,0)$ we see that $\frac{d^2y}{dx^2}$ changes from negative to positive.

This means that $\frac{dy}{dx}$ (the gradient of the curve) changes from decreasing to increasing (there is a minimum point), which means in turn that the concavity of the function changes from concave down to concave up.

The point is therefore a horizontal inflexion.



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