

Chapter 10 / Example 10

Finding the minimum value of a function

In this question the GDC could be used to check the results found otherwise.

A can of dog food contains 500 cm^3 of food. The manufacturer, wanting to make sure that the company received maximum profits, would like to make sure that the surface area of the can was as small as possible. Let the radius of the can be r cm and the height, h cm.

- Find an expression for the surface area S in terms of r .
- Find $\frac{dy}{dx}$.
- Hence, find the dimensions of the can that will have the minimum surface area.

$$S = 1000r^{-1} + 2\pi r^2$$

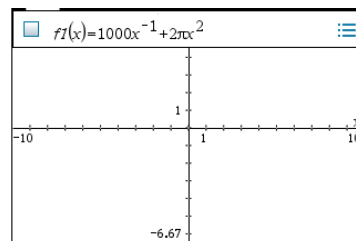
Open a new document and add a Graphs page.

The entry line is displayed at the top of the work area.

The default graph type is function, so ' $f1(x)=$ ' is displayed.

The default axes are $-10 \leq x \leq 10$ and $-6.67 \leq y \leq 6.67$.

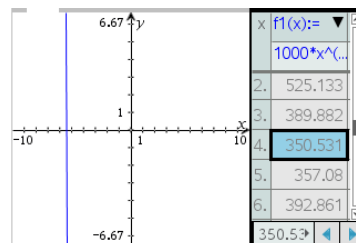
Type $1000x^{-1} + 2\pi x^2$ and press **enter**.



To get an idea of the best window to view the graph in, it is helpful to use a table of values. Press **ctrl** **T**.

A table of values is displayed alongside the graph.

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



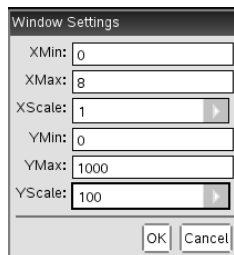
Use this information to choose suitable window settings to display the graph.

Press **ctrl** **T** again to remove the table.

Press **menu** 4:Window/Zoom | 1:Window Settings...

Set the axes to show $0 \leq x \leq 8$ with a scale of 1 and $0 \leq y \leq 1000$ with a scale of 100.

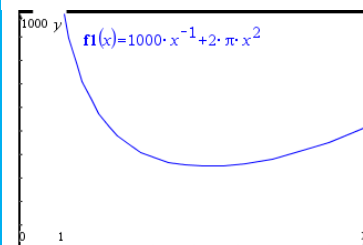
Press **enter** when you have finished.



Chapter 10 / **Example 10**

Finding the minimum value of a function

The GDC displays the graph of $f_1(x)$.

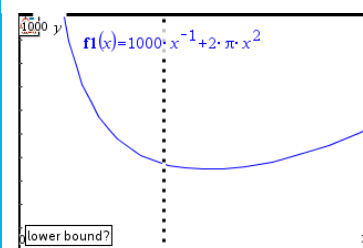


GDC

To find the minimum press **menu** 6:Analyse Graph | 2: Minimum
You will need to give the lower and upper bounds of the region that includes the minimum.

The GDC shows a line and asks you to set the lower bound.
Move the line using the touchpad and choose a position to the left of the minimum.

Click the touchpad.

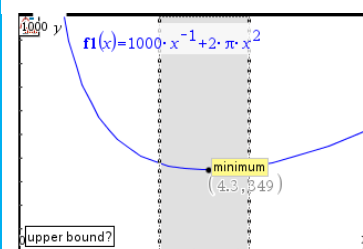


The GDC shows another line and asks you to set the upper bound.

Use the touchpad to move the line so that the region between the lower and upper bounds contains the minimum.

When the region contains the minimum, the calculator will display the word 'minimum' in a box.

Click the touchpad.



The GDC displays a minimum point at 4.30, 349 .

So, the best dimensions for the can are $r = 4.30$ cm and $h = 8.60$ cm with a surface area of 349 cm^2 .

