

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.

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

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

Type $1000x^{-1} + 2\pi x^2$ and press **EXE** to enter the equation as Y1.

To get an 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 0 and ends at 10.

Press **EXIT**.

Press **F6** TABLE.

A table of values is displayed.

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.

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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 $0 \leq x \leq 8$ with a scale of 1 and $0 \leq y \leq 1000$ with a scale of 100.

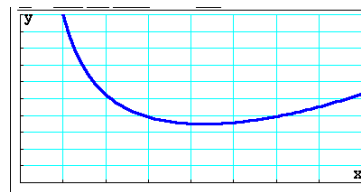
You can leave the other items as they are.

Press **EXIT** when you have finished.

```
View Window
Xmin : 0
max : 8
scale: 1
dot : 0.02116402
Ymin : 0
max : 1000
INITIAL TRIG STANDARD V-MEM SQUARE
```

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

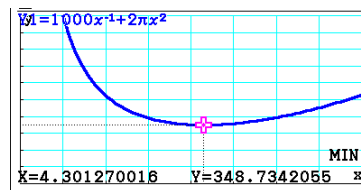
The GDC displays the graph Y1.



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 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 .

