

Chapter 3 / **Example 14c**

Finding the minimum value of a function

At time $t = 0$ a model boat A is at $(2, 5)$ and is travelling with a speed of 4 ms^{-1} in the direction of $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$. The x component is the displacement due east from an origin and the y component due north. All distances are in metres.

- c Find the shortest distance between the two boats and the value of t at which this occurs.

The distance between the two boats is

$$\sqrt{(1 - 0.4t)^2 + (-7 + 4.2t)^2}$$

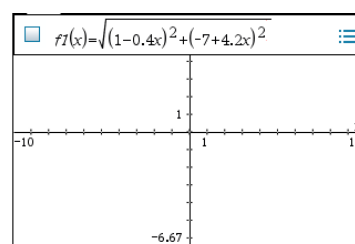
Open a new document and add a Graphs page.

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

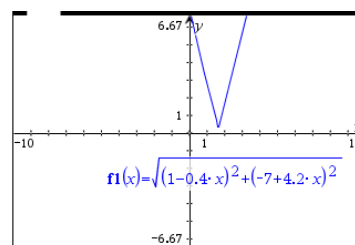
The default graph type is function, so ' $f1(x)=$ ' is displayed.

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

Type $\sqrt{(1 - 0.4x)^2 + (-7 + 4.2x)^2}$ and press **enter**.



The GDC displays the graph $f1(x) = -0.5x^2 + 7.5x - 18$ with the default axes.

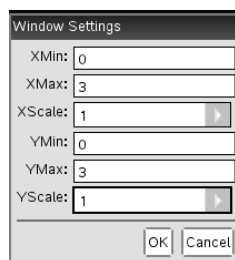


Press **menu** 4:Window/Zoom | 1:Window Settings...

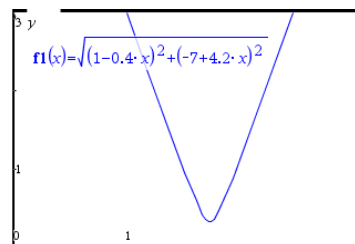
Set the axes to show $0 \leq x \leq 3$ and $0 \leq y \leq 3$.

Set the scales to 1.

Press **enter** when you have finished.



The GDC now displays $f1(x)$ in a suitable window.



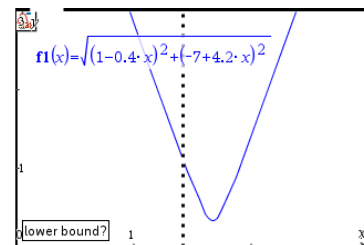
Chapter 3 / **Example 14c****Finding the minimum value of a function**

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.

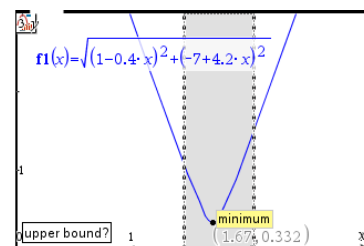


The GDC shows another line and asks you to set the upper bound.

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 the minimum at (1.67, 0.332).

Minimum distance is 0.332 m when $t = 1.67$ s.

