

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.

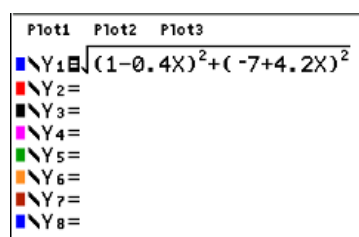
- c Find the shortest distance between the two boats and the value of t at which this occurs.

The distance between the two boats is

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

Press $[F1]$ $[Y=]$ to display the equation entry screen.

Type $\sqrt{1 - 0.4x^2 + -7 + 4.2x^2}$ and press $[ENTER]$ to enter the equation as Y_1 .

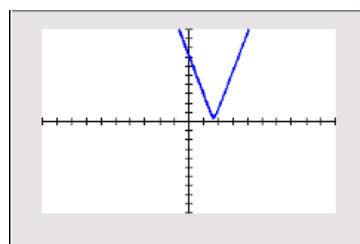


Press $[F5]$ $[GRAPH]$ to display the graph screen

The GDC now displays the quadratic function:

$$Y_1 = \sqrt{1 - 0.4x^2 + -7 + 4.2x^2}$$

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



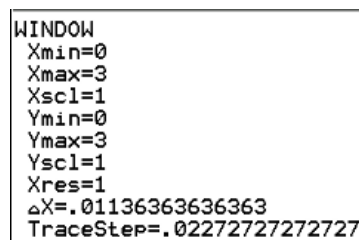
Choose suitable window settings to display the graph.

Press $[F2]$ $[WINDOW]$

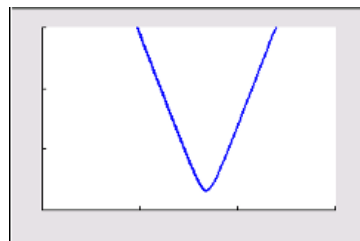
Set the axes to show $0 \leq x \leq 3$ and $0 \leq y \leq 3$

You can leave the other items as they are.

Press $[F5]$ $[GRAPH]$ when you have finished.



The GDC now displays Y_1 in a suitable window.



Chapter 3 / **Example 14c**

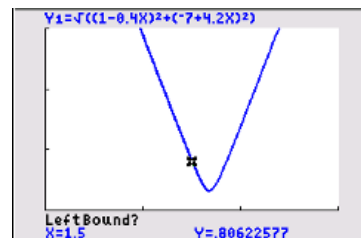
Finding the minimum value of a function

To find the minimum press $\boxed{2\text{nd}} \boxed{f4} \boxed{\text{CALC}} 3:\text{minimum}$

You will need to give the left and right bounds of the region that includes the minimum.

The GDC shows a point on the curve and asks you to set the left bound. Move the point using $\boxed{\blacktriangleright}$ $\boxed{\blacktriangleleft}$ and choose a position to the left of the turning point.

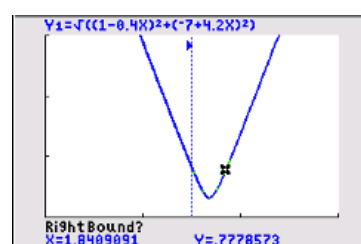
Press $\boxed{\text{ENTER}}$.



The GDC shows a line where you have set the left bound and a point on the curve.

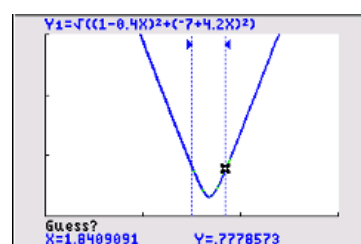
Move the point using $\boxed{\blacktriangleright}$ $\boxed{\blacktriangleleft}$ and choose a position to the right of the turning point.

When the region contains the turning point, Press $\boxed{\text{ENTER}}$.



The GDC requires an initial guess for the position of the turning point. Choose the default position.

Press $\boxed{\text{ENTER}}$.



The GDC displays the minimum at $(1.67, 0.332)$.

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

