



TG 4 An object is moving on the x -axis.

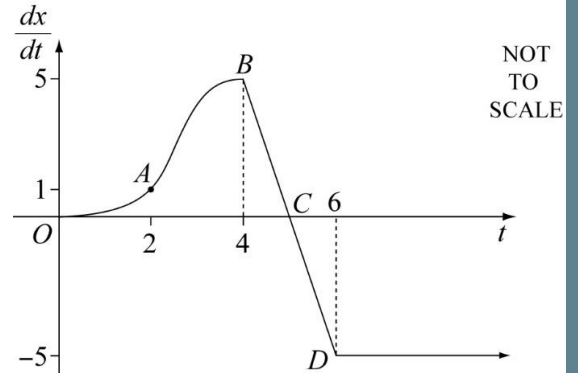
ADI

The graph shows the velocity, $\frac{dx}{dt}$, of the object as a function of time t .

The coordinates of the points shown on the graph are $A(2, 1)$, $B(4, 5)$, $C(5, 0)$ and $D(6, -5)$.

The velocity is constant for $t \geq 6$.

- Use the trapezoidal rule to estimate the distance travelled between $t = 0$ and $t = 4$, using 2 strips*. * : projectmaths
- The object is initially at the origin. When is the displacement of the object decreasing?
- Estimate the time at which the object returns to the origin. Justify your answer.
- Sketch the displacement x as a function of time.



$$\begin{aligned} \text{(a) Distance} &= \frac{2}{2} [0 + 5 + 2(1)] \\ &= 7 \end{aligned}$$

\therefore the object has travelled approximately 7 units.

(b) The velocity is positive until C . The object stops and starts moving back towards the origin. This means the displacement is decreasing after C .
 \therefore after 5 seconds.

(c) From the origin to C the area under the curve is approximately $7 + \frac{1}{2} \times 1 \times 5 = 9\frac{1}{2}$.

Let x = time elapsed after 6 seconds:

$$\text{Area} = \frac{1}{2} \times 1 \times 5 + 5 \times x = 9\frac{1}{2}$$

$$2\frac{1}{2} + 5 \times x = 9\frac{1}{2}$$

$$5x = 7$$

$$x = 1.4$$

As $6 + 1.4$ is 7.4 , the object returns after 7.4 s.

Alternatively, ignore the 2 triangles, so that the area of the rectangle must be 7. (from (a))

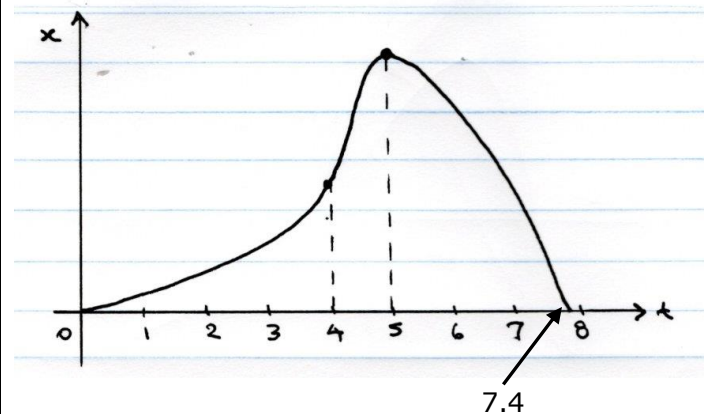
$$5 \times \text{width} = 7$$

$$\text{width} = \frac{7}{5}$$

$$= 1.4$$

The object returns after $6 + 1.4 = 7.4$ s.

(d)



* These solutions have been provided by [projectmaths](http://projectmaths.com.au) and are not supplied or endorsed by NESA.

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