adamjee maths

A-LEVEL MATHS / EDEXCEL / FREE RESOURCES

Quadratics

Question paper

4 questions

Exam questions and marking instructions remain credited to their board.

Contents

1 June 2025 - Paper 1 - Q4

2 June 2024 - Paper 2 - Q9

3 October 2021 - Paper 1 - Q12

4 June 2018 - Paper 2 - Q8

4. Given that

- $f(x) = 2x^3 + 3x^2 - 16x + 16$
- $f(-4) = 0$

(a) write $f(x)$ in the form

$$(x + a)\,Q(x)$$

where a is a constant and $Q(x)$ is a quadratic expression.

(3)

(b) Hence prove that –4 is the only real root of the equation

$$f(x) = 0$$

(*Solutions relying on calculator technology are not acceptable.*)

(2)

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Question 4 continued

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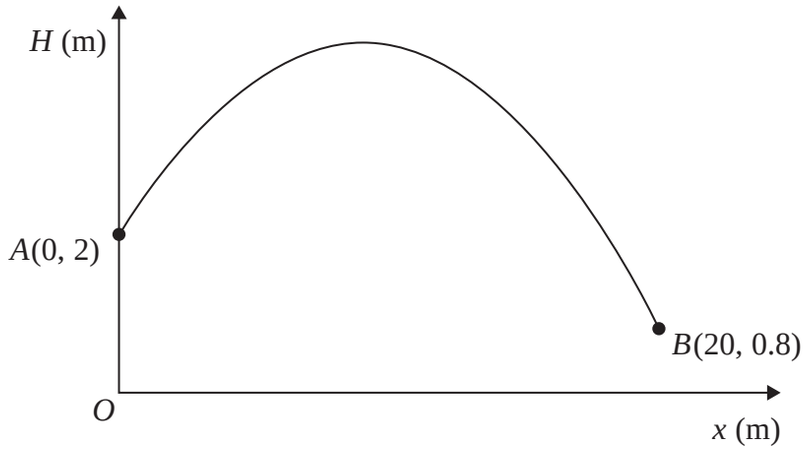


Figure 3

The graph in Figure 3 shows the path of a small ball.

The ball travels in a vertical plane above horizontal ground.

The ball is thrown from the point represented by A and caught at the point represented by B.

The height, H metres, of the ball above the ground has been plotted against the horizontal distance, x metres, measured from the point where the ball was thrown.

With respect to a fixed origin O, the point A has coordinates (0, 2) and the point B has coordinates (20, 0.8), as shown in Figure 3.

The ball reaches its maximum height when $x = 9$

A quadratic function, linking H with x, is used to model the path of the ball.

(a) Find H in terms of x.

(4)

(b) Give one limitation of the model.

(1)

Chandra is standing directly under the path of the ball at a point 16 m horizontally from O.

Chandra can catch the ball if the ball is less than 2.5 m above the ground.

(c) Use the model to determine if Chandra can catch the ball.

(2)

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Question 9 continued

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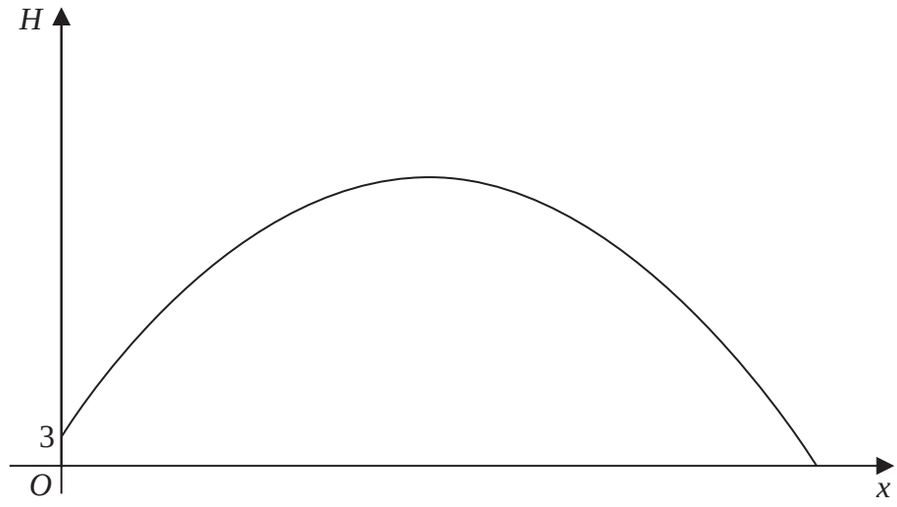


Figure 3

Figure 3 is a graph of the trajectory of a golf ball after the ball has been hit until it first hits the ground.

The vertical height, H metres, of the ball above the ground has been plotted against the horizontal distance travelled, x metres, measured from where the ball was hit.

The ball is modelled as a particle travelling in a vertical plane above horizontal ground.

Given that the ball

- is hit from a point on the top of a platform of vertical height 3 m above the ground
- reaches its maximum vertical height after travelling a horizontal distance of 90 m
- is at a vertical height of 27 m above the ground after travelling a horizontal distance of 120 m

Given also that H is modelled as a **quadratic** function in x

(a) find H in terms of x

(5)

(b) Hence find, according to the model,

(i) the maximum vertical height of the ball above the ground,

(ii) the horizontal distance travelled by the ball, from when it was hit to when it first hits the ground, giving your answer to the nearest metre.

(3)

(c) The possible effects of wind or air resistance are two limitations of the model. Give one other limitation of this model.

(1)

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Question 12 continued

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Question 12 continued

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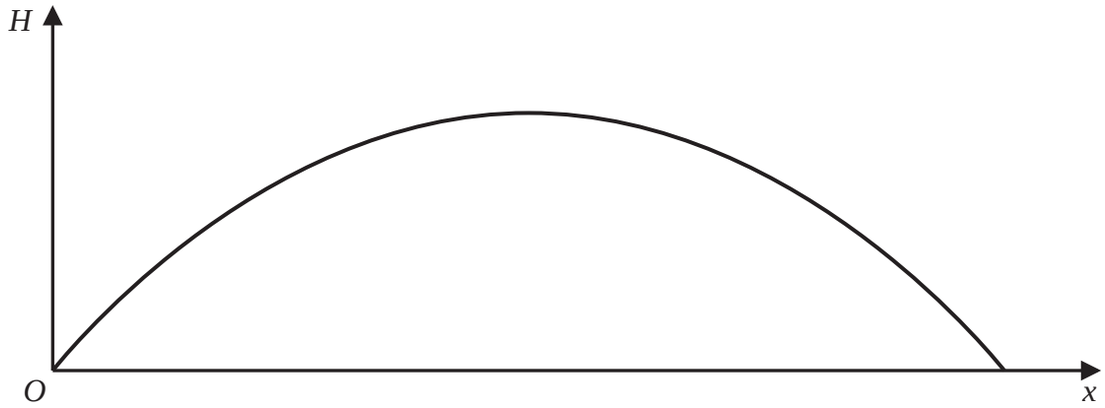


Figure 1

Figure 1 is a graph showing the trajectory of a rugby ball.

The height of the ball above the ground, H metres, has been plotted against the horizontal distance, x metres, measured from the point where the ball was kicked.

The ball travels in a vertical plane.

The ball reaches a maximum height of 12 metres and hits the ground at a point 40 metres from where it was kicked.

(a) Find a quadratic equation linking H with x that models this situation.

(3)

The ball passes over the horizontal bar of a set of rugby posts that is perpendicular to the path of the ball. The bar is 3 metres above the ground.

(b) Use your equation to find the greatest horizontal distance of the bar from O.

(3)

(c) Give one limitation of the model.

(1)

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