adamjee maths

A-LEVEL MATHS / EDEXCEL / FREE RESOURCES

Straight lines

Question paper

3 questions

Exam questions and marking instructions remain credited to their board.

Contents

1 June 2025 - Paper 1 - Q12

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12.

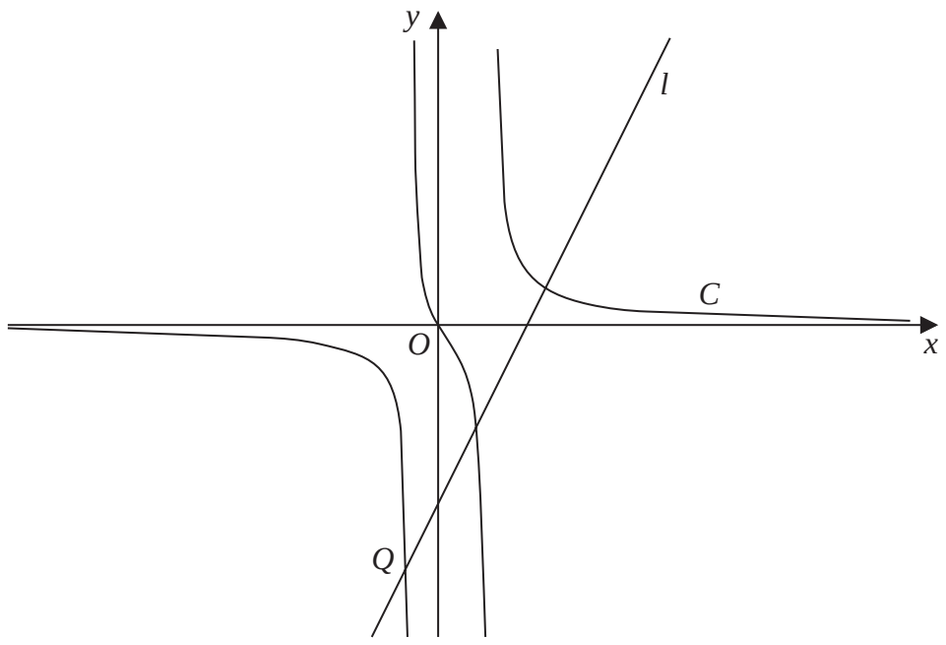


Figure 3

Figure 3 shows a sketch of the curve C with equation

$$y = \frac{15x}{(2x + 3)(x - 3)} \qquad x \neq -\frac{3}{2} \quad x \neq 3$$

and the straight line l with equation

$$y = 2x - 10$$

(a) Verify that C and l intersect where $x = 6$

(2)

The curve and line also intersect at the point Q shown in Figure 3.

(b) Show that the x coordinate of Q is a solution of

$$4x^3 - 26x^2 - 3x + 90 = 0$$

(2)

(c) Using algebra and showing all stages of working, find the exact x coordinate of Q.

(4)

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Question 12 continued

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Question 12 continued

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13. The world human population, P billions, is modelled by the equation

$$P = ab^t$$

where a and b are constants and t is the number of years after 2004

Using the estimated population figures for the years from 2004 to 2007, a graph is plotted of $\log_{10}P$ against t.

The points lie approximately on a straight line with

- gradient 0.0054
- intercept 0.81 on the $\log_{10}P$ axis

(a) Estimate, to 3 decimal places, the value of a and the value of b.

(4)

In the context of the model,

(b) (i) interpret the value of the constant a,

(ii) interpret the value of the constant b.

(2)

(c) Use the model to estimate the world human population in 2030

(2)

(d) Comment on the reliability of the answer to part (c).

(1)

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Question 13 continued

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Question 13 continued

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Question 13 continued

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10.

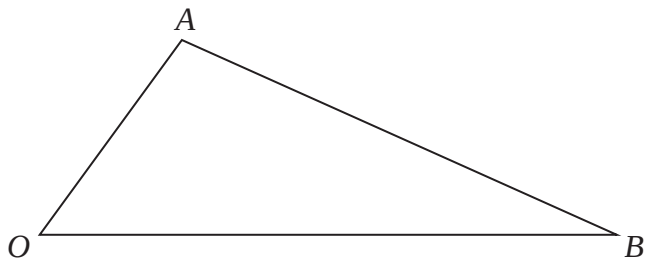


Figure 7

Figure 7 shows a sketch of triangle OAB.

The point C is such that $\overrightarrow{OC} = 2\overrightarrow{OA}$.

The point M is the midpoint of AB.

The straight line through C and M cuts OB at the point N.

Given $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

(a) Find $\overrightarrow{CM}$ in terms of $\mathbf{a}$ and $\mathbf{b}$

(2)

(b) Show that $\overrightarrow{ON} = \left(2 - \frac{3}{2}\lambda\right)\mathbf{a} + \frac{1}{2}\lambda\mathbf{b}$, where λ is a scalar constant.

(2)

(c) Hence prove that $ON : NB = 2 : 1$

(2)

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Question 10 continued

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