

Question 3 continued

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Q3

(Total 6 marks)



4.

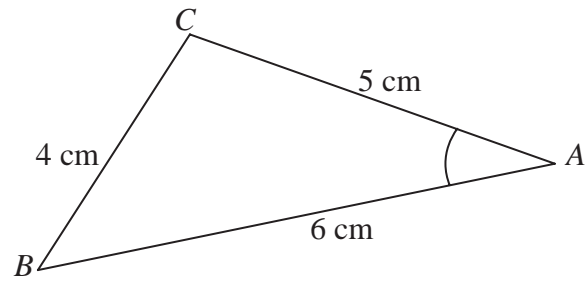


Figure 1

Figure 1 shows the triangle ABC , with $AB = 6$ cm, $BC = 4$ cm and $CA = 5$ cm.

(a) Show that $\cos A = \frac{3}{4}$.

(3)

(b) Hence, or otherwise, find the exact value of $\sin A$.

(2)





Question 4 continued

Lined area for writing answers.

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Q4

(Total 5 marks)

7



H 2 6 1 0 8 A 0 7 2 4

Turn over

5. The curve C has equation

$$y = x\sqrt{x^3 + 1}, \quad 0 \leq x \leq 2.$$

- (a) Complete the table below, giving the values of y to 3 decimal places at $x = 1$ and $x = 1.5$.

x	0	0.5	1	1.5	2
y	0	0.530			6

(2)

- (b) Use the trapezium rule, with all the y values from your table, to find an approximation for the value of $\int_0^2 x\sqrt{x^3 + 1} dx$, giving your answer to 3 significant figures.

(4)

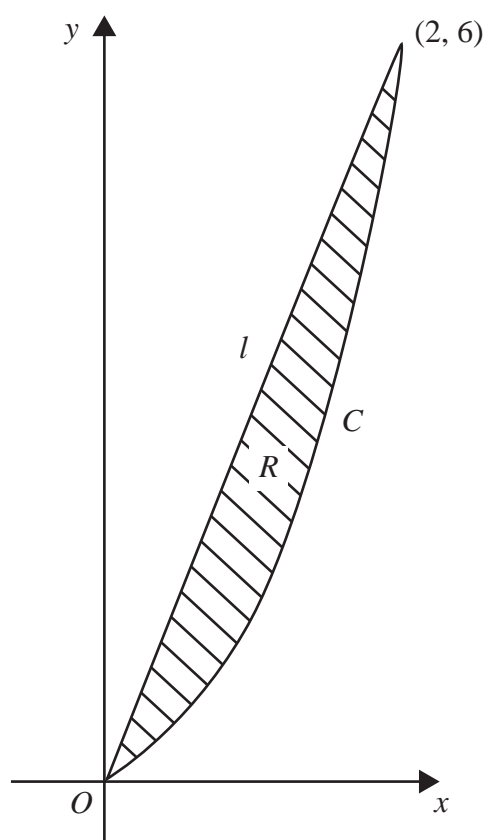


Figure 2

Figure 2 shows the curve C with equation $y = x\sqrt{x^3 + 1}$, $0 \leq x \leq 2$, and the straight line segment l , which joins the origin and the point $(2, 6)$. The finite region R is bounded by C and l .

- (c) Use your answer to part (b) to find an approximation for the area of R , giving your answer to 3 significant figures.

(3)





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Question 5 continued

Lined writing area for the answer to Question 5, consisting of approximately 38 horizontal lines.



7.

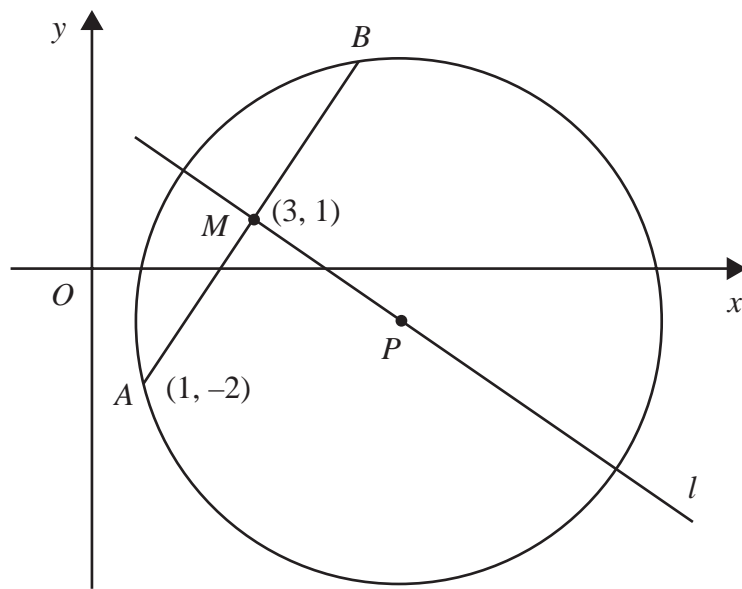


Figure 3

The points A and B lie on a circle with centre P , as shown in Figure 3. The point A has coordinates $(1, -2)$ and the mid-point M of AB has coordinates $(3, 1)$. The line l passes through the points M and P .

(a) Find an equation for l . (4)

Given that the x -coordinate of P is 6,

(b) use your answer to part (a) to show that the y -coordinate of P is -1 , (1)

(c) find an equation for the circle. (4)



Question 7 continued

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Lined area for writing the answer to Question 7 continued.



Question 7 continued

Lined writing area for the answer to Question 7.

Leave blank

(Total 9 marks)

Q7

Marking box for Q7.



8. A trading company made a profit of £50 000 in 2006 (Year 1).

A model for future trading predicts that profits will increase year by year in a geometric sequence with common ratio r , $r > 1$.

The model therefore predicts that in 2007 (Year 2) a profit of £50 000 r will be made.

(a) Write down an expression for the predicted profit in Year n . (1)

The model predicts that in Year n , the profit made will exceed £200 000.

(b) Show that $n > \frac{\log 4}{\log r} + 1$. (3)

Using the model with $r = 1.09$,

(c) find the year in which the profit made will first exceed £200 000, (2)

(d) find the total of the profits that will be made by the company over the 10 years from 2006 to 2015 inclusive, giving your answer to the nearest £10 000. (3)



9. (a) Sketch, for $0 \leq x \leq 2\pi$, the graph of $y = \sin\left(x + \frac{\pi}{6}\right)$.

(2)

(b) Write down the exact coordinates of the points where the graph meets the coordinate axes.

(3)

(c) Solve, for $0 \leq x \leq 2\pi$, the equation

$$\sin\left(x + \frac{\pi}{6}\right) = 0.65,$$

giving your answers in radians to 2 decimal places.

(5)



10.

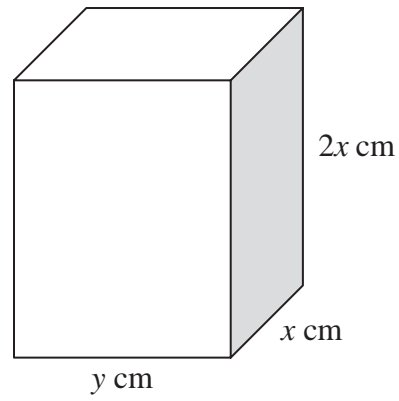


Figure 4

Figure 4 shows a solid brick in the shape of a cuboid measuring $2x$ cm by x cm by y cm.

The total surface area of the brick is 600 cm².

(a) Show that the volume, V cm³, of the brick is given by

$$V = 200x - \frac{4x^3}{3}.$$

(4)

Given that x can vary,

(b) use calculus to find the maximum value of V , giving your answer to the nearest cm³.

(5)

(c) Justify that the value of V you have found is a maximum.

(2)



Question 10 continued

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Lined area for writing the answer to Question 10.

(Total 11 marks)

Q10

TOTAL FOR PAPER: 75 MARKS

END

