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2. (a) Find the first 3 terms, in ascending powers of x , of the binomial expansion of

$$(3 + bx)^5$$

where b is a non-zero constant. Give each term in its simplest form.

(4)

Given that, in this expansion, the coefficient of x^2 is twice the coefficient of x ,

(b) find the value of b .

(2)



4. The circle C has equation

$$x^2 + y^2 + 4x - 2y - 11 = 0$$

Find

(a) the coordinates of the centre of C ,

(2)

(b) the radius of C ,

(2)

(c) the coordinates of the points where C crosses the y -axis, giving your answers as simplified surds.

(4)



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Question 4 continued

Lined area for writing the answer to Question 4.

Q4

(Total 8 marks)



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5.

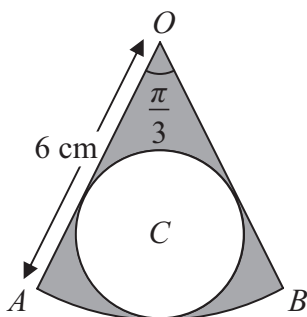


Figure 1

The shape shown in Figure 1 is a pattern for a pendant. It consists of a sector OAB of a circle centre O , of radius 6 cm, and angle $AOB = \frac{\pi}{3}$. The circle C , inside the sector, touches the two straight edges, OA and OB , and the arc AB as shown.

Find

- (a) the area of the sector OAB , (2)

- (b) the radius of the circle C . (3)

The region outside the circle C and inside the sector OAB is shown shaded in Figure 1.

- (c) Find the area of the shaded region. (2)



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Question 5 continued

Lined area for writing the answer to Question 5 continued.

(Total 7 marks)

Q5



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7. (a) Solve for $0 \leq x < 360^\circ$, giving your answers in degrees to 1 decimal place,

$$3 \sin(x + 45^\circ) = 2$$

(4)

(b) Find, for $0 \leq x < 2\pi$, all the solutions of

$$2 \sin^2 x + 2 = 7 \cos x$$

giving your answers in radians.

You must show clearly how you obtained your answers.

(6)



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Question 7 continued

Lined writing area for the answer to Question 7.



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8.

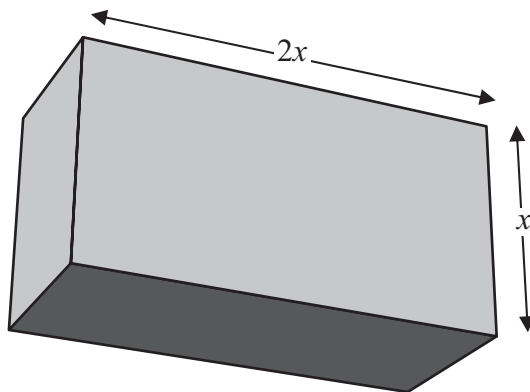


Figure 2

A cuboid has a rectangular cross-section where the length of the rectangle is equal to twice its width, x cm, as shown in Figure 2.

The volume of the cuboid is 81 cubic centimetres.

(a) Show that the total length, L cm, of the twelve edges of the cuboid is given by

$$L = 12x + \frac{162}{x^2} \tag{3}$$

(b) Use calculus to find the minimum value of L . (6)

(c) Justify, by further differentiation, that the value of L that you have found is a minimum. (2)



9.

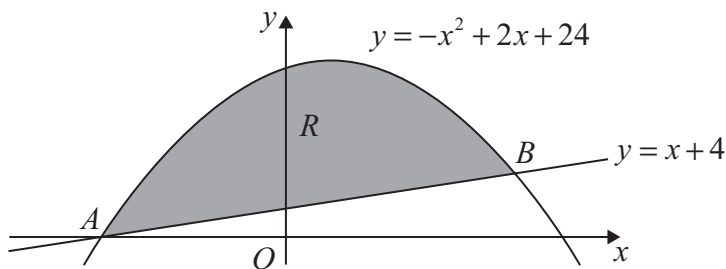


Figure 3

The straight line with equation $y = x + 4$ cuts the curve with equation $y = -x^2 + 2x + 24$ at the points A and B , as shown in Figure 3.

(a) Use algebra to find the coordinates of the points A and B . (4)

The finite region R is bounded by the straight line and the curve and is shown shaded in Figure 3.

(b) Use calculus to find the exact area of R . (7)



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Question 9 continued

(This section contains 27 horizontal lines for the answer to Question 9.)



P 3 8 1 5 8 A 0 3 1 3 2

