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2. Use calculus to find the exact value of $\int_1^2 \left(3x^2 + 5 + \frac{4}{x^2} \right) dx$.

(5)

Q2

(Total 5 marks)



5. (a) In the space provided, sketch the graph of $y = 3^x$, $x \in \mathbb{R}$, showing the coordinates of the point at which the graph meets the y-axis.

(2)

- (b) Complete the table, giving the values of 3^x to 3 decimal places.

x	0	0.2	0.4	0.6	0.8	1
3^x		1.246	1.552			3

(2)

- (c) Use the trapezium rule, with all the values from your table, to find an approximation

for the value of $\int_0^1 3^x dx$.

(4)



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Question 6 continued

Lined area for writing the answer to Question 6.

Q6

(Total 4 marks)

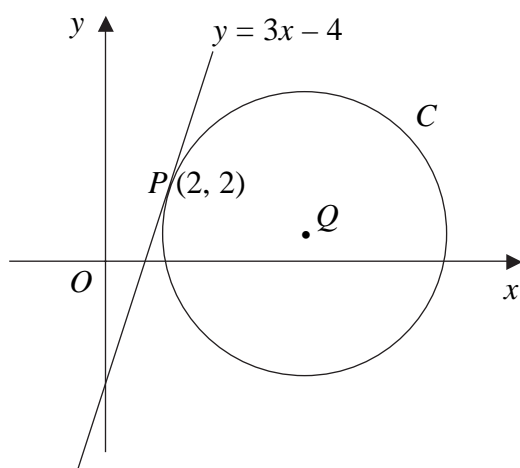
11

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7.

Figure 1



The line $y = 3x - 4$ is a tangent to the circle C , touching C at the point $P(2, 2)$, as shown in Figure 1.

The point Q is the centre of C .

- (a) Find an equation of the straight line through P and Q . (3)

Given that Q lies on the line $y = 1$,

- (b) show that the x -coordinate of Q is 5, (1)

- (c) find an equation for C . (4)



8.

Figure 2

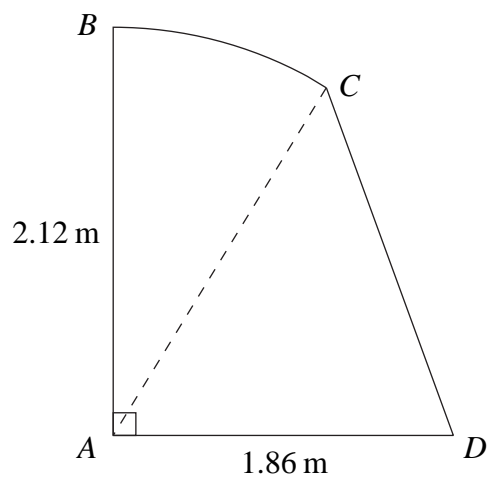


Figure 2 shows the cross section $ABCD$ of a small shed.
 The straight line AB is vertical and has length 2.12 m.
 The straight line AD is horizontal and has length 1.86 m.
 The curve BC is an arc of a circle with centre A , and CD is a straight line.
 Given that the size of $\angle BAC$ is 0.65 radians, find

- (a) the length of the arc BC , in m, to 2 decimal places, (2)
- (b) the area of the sector BAC , in m^2 , to 2 decimal places, (2)
- (c) the size of $\angle CAD$, in radians, to 2 decimal places, (2)
- (d) the area of the cross section $ABCD$ of the shed, in m^2 , to 2 decimal places. (3)



Question 8 continued

Lined writing area consisting of approximately 28 horizontal lines.

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(Total 9 marks)

Q8



Question 9 continued

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Lined area for writing answers.

(Total 11 marks)

Q9

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N 2 3 5 5 8 A 0 1 7 2 0

10.

Figure 3

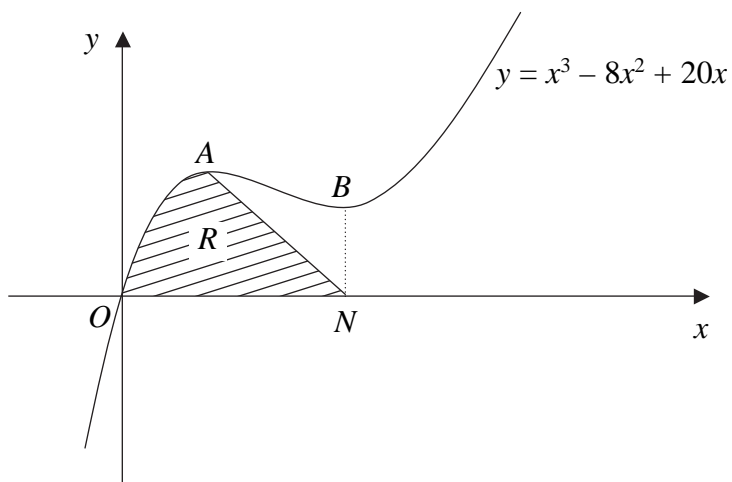


Figure 3 shows a sketch of part of the curve with equation $y = x^3 - 8x^2 + 20x$. The curve has stationary points A and B .

- (a) Use calculus to find the x -coordinates of A and B . (4)

- (b) Find the value of $\frac{d^2y}{dx^2}$ at A , and hence verify that A is a maximum. (2)

The line through B parallel to the y -axis meets the x -axis at the point N . The region R , shown shaded in Figure 3, is bounded by the curve, the x -axis and the line from A to N .

- (c) Find $\int (x^3 - 8x^2 + 20x) dx$. (3)

- (d) Hence calculate the exact area of R . (5)



Question 10 continued

Lined area for writing the answer to Question 10.

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Q10

(Total 14 marks)

TOTAL FOR PAPER: 75 MARKS

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