

1.

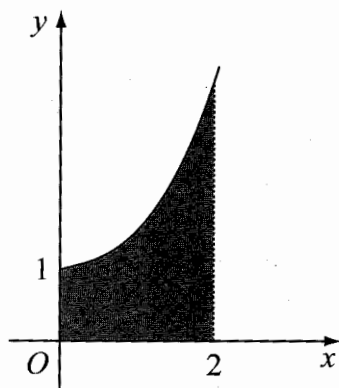


Figure 1

Figure 1 shows part of the curve with equation $y = e^{0.5x^2}$. The finite region R , shown shaded in Figure 1, is bounded by the curve, the x -axis, the y -axis and the line $x = 2$.

(a) Complete the table with the values of y corresponding to $x = 0.8$ and $x = 1.6$.

| | | | | | | |
|-----|-------|------------|-----|------------|-----|-------|
| x | 0 | 0.4 | 0.8 | 1.2 | 1.6 | 2 |
| y | e^0 | $e^{0.08}$ | | $e^{0.72}$ | | e^2 |

(1)

(b) Use the trapezium rule with all the values in the table to find an approximate value for the area of R , giving your answer to 4 significant figures.

(3)



3.

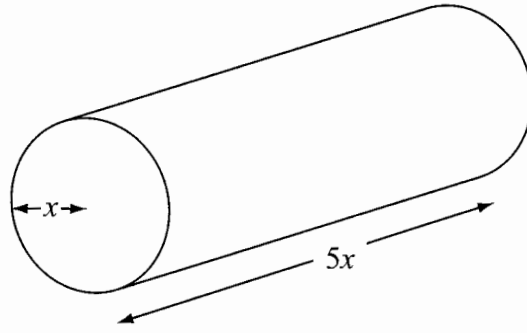


Figure 2

Figure 2 shows a right circular cylindrical metal rod which is expanding as it is heated. After t seconds the radius of the rod is x cm and the length of the rod is $5x$ cm. The cross-sectional area of the rod is increasing at the constant rate of $0.032 \text{ cm}^2 \text{ s}^{-1}$.

(a) Find $\frac{dx}{dt}$ when the radius of the rod is 2 cm, giving your answer to 3 significant figures. (4)

(b) Find the rate of increase of the volume of the rod when $x = 2$. (4)



Question 3 continued

Lined writing area for the answer to Question 3.



4. A curve has equation $3x^2 - y^2 + xy = 4$. The points P and Q lie on the curve. The gradient of the tangent to the curve is $\frac{8}{3}$ at P and at Q .

(a) Use implicit differentiation to show that $y - 2x = 0$ at P and at Q .

(6)

(b) Find the coordinates of P and Q .

(3)



Question 4 continued

Lined writing area for the answer to Question 4.



Question 4 continued

A large rectangular area containing 25 horizontal lines for writing, intended for the answer to Question 4.



Question 4 continued

Lined area for writing the answer to Question 4.

Q4

(Total 9 marks)



H 3 0 4 2 7 A 0 1 3 2 8

Question 5 continued

Lined writing area for the answer to Question 5.

Q5

(Total 9 marks)



Question 6 continued

Lined writing area for the answer to Question 6.



Question 6 continued

Lined writing area for the answer to Question 6.

Q6

(Total 12 marks)



Question 7 continued

Lined area for writing the answer to Question 7.

(Total 11 marks)

Q7

| | |
|--|--|
| | |
|--|--|



H 3 0 4 2 7 A 0 2 3 2 8

8.

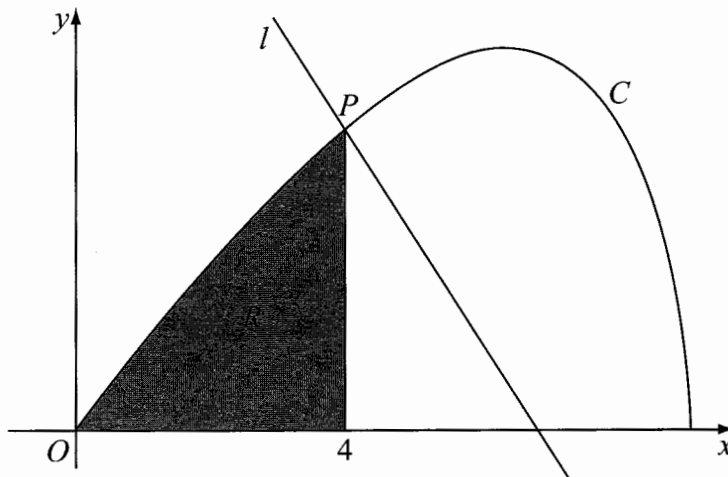


Figure 3

Figure 3 shows the curve C with parametric equations

$$x = 8 \cos t, \quad y = 4 \sin 2t, \quad 0 \leq t \leq \frac{\pi}{2}.$$

The point P lies on C and has coordinates $(4, 2\sqrt{3})$.

- (a) Find the value of t at the point P . (2)

The line l is a normal to C at P .

- (b) Show that an equation for l is $y = -x\sqrt{3} + 6\sqrt{3}$. (6)

The finite region R is enclosed by the curve C , the x -axis and the line $x = 4$, as shown shaded in Figure 3.

- (c) Show that the area of R is given by the integral $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} 64 \sin^2 t \cos t \, dt$. (4)

- (d) Use this integral to find the area of R , giving your answer in the form $a + b\sqrt{3}$, where a and b are constants to be determined. (4)



Question 8 continued

Lined area for writing the answer to Question 8.



Question 8 continued

Lined area for writing the answer to Question 8.

Q8

(Total 16 marks)

TOTAL FOR PAPER: 75 MARKS

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