

1.

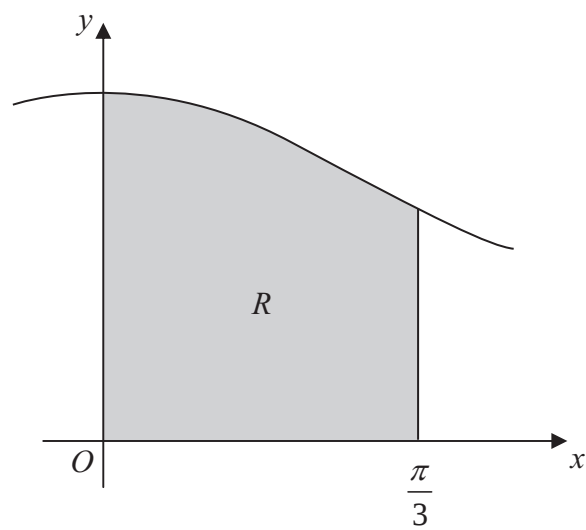


Figure 1

Figure 1 shows part of the curve with equation $y = \sqrt{(0.75 + \cos^2 x)}$. The finite region R , shown shaded in Figure 1, is bounded by the curve, the y -axis, the x -axis and the line with equation $x = \frac{\pi}{3}$.

(a) Complete the table with values of y corresponding to $x = \frac{\pi}{6}$ and $x = \frac{\pi}{4}$.

x	0	$\frac{\pi}{12}$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$
y	1.3229	1.2973			1

(2)

(b) Use the trapezium rule

(i) with the values of y at $x = 0$, $x = \frac{\pi}{6}$ and $x = \frac{\pi}{3}$ to find an estimate of the area of R .
Give your answer to 3 decimal places.

(ii) with the values of y at $x = 0$, $x = \frac{\pi}{12}$, $x = \frac{\pi}{6}$, $x = \frac{\pi}{4}$ and $x = \frac{\pi}{3}$ to find a
further estimate of the area of R . Give your answer to 3 decimal places.

(6)



[illegible]

2. Using the substitution $u = \cos x + 1$, or otherwise, show that

$$\int_0^{\frac{\pi}{2}} e^{\cos x + 1} \sin x \, dx = e(e - 1)$$

(6)

[illegible]

3. A curve C has equation

$$2^x + y^2 = 2xy$$

Find the exact value of $\frac{dy}{dx}$ at the point on C with coordinates $(3, 2)$.

(7)



4. A curve C has parametric equations

$$x = \sin^2 t, \quad y = 2 \tan t, \quad 0 \leq t < \frac{\pi}{2}$$

(a) Find $\frac{dy}{dx}$ in terms of t .

(4)

The tangent to C at the point where $t = \frac{\pi}{3}$ cuts the x -axis at the point P .

(b) Find the x -coordinate of P .

(6)

[illegible]

5. $\frac{2x^2+5x-10}{(x-1)(x+2)} \equiv A + \frac{B}{x-1} + \frac{C}{x+2}$

- (a) Find the values of the constants A , B and C .

(4)

- (b) Hence, or otherwise, expand $\frac{2x^2 + 5x - 10}{(x-1)(x+2)}$ in ascending powers of x , as far as the term in x^2 . Give each coefficient as a simplified fraction.

(7)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

6.

$$f(\theta) = 4\cos^2\theta - 3\sin^2\theta$$

- (a) Show that $f(\theta) = \frac{1}{2} + \frac{7}{2} \cos 2\theta$.

(3)

- (b) Hence, using calculus, find the exact value of $\int_0^{\frac{\pi}{2}} \theta f(\theta) \, d\theta$.

(7)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



[illegible]

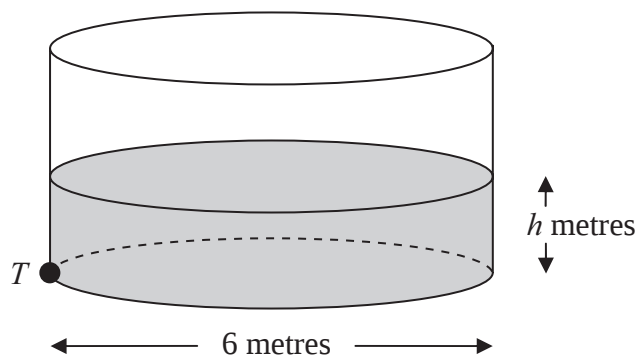


Figure 2

(a) Show that t minutes after the tap has been opened

$$75 \frac{dh}{dt} = (4 - 5h) \quad (5)$$

When $t = 0$, $h = 0.2$

(b) Find the value of t when $h = 0.5$ (6)



Leave
blank

Question 8 continued

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Q8

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

END

