

1.

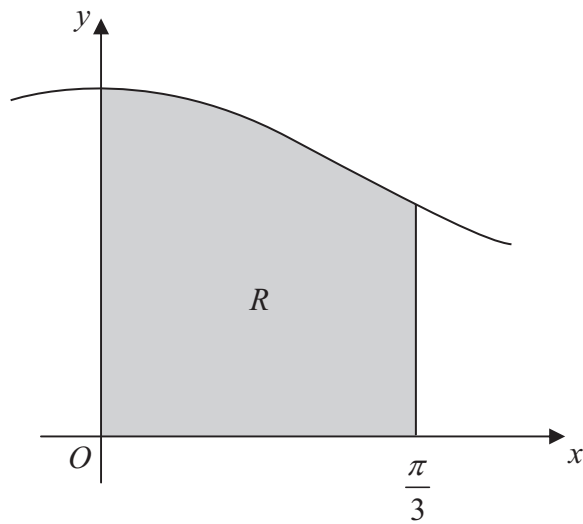


Figure 1

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)





Question 4 continued

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H 3 5 3 8 6 A 0 1 3 3 2



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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)



Question 5 continued

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Ruled lines for writing the answer to Question 5.



7. The line l_1 has equation $\mathbf{r} = \begin{pmatrix} 2 \\ 3 \\ -4 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$, where λ is a scalar parameter.

The line l_2 has equation $\mathbf{r} = \begin{pmatrix} 0 \\ 9 \\ -3 \end{pmatrix} + \mu \begin{pmatrix} 5 \\ 0 \\ 2 \end{pmatrix}$, where μ is a scalar parameter.

Given that l_1 and l_2 meet at the point C , find

(a) the coordinates of C . **(3)**

The point A is the point on l_1 where $\lambda = 0$ and the point B is the point on l_2 where $\mu = -1$.

(b) Find the size of the angle ACB . Give your answer in degrees to 2 decimal places. **(4)**

(c) Hence, or otherwise, find the area of the triangle ABC . **(5)**



8.

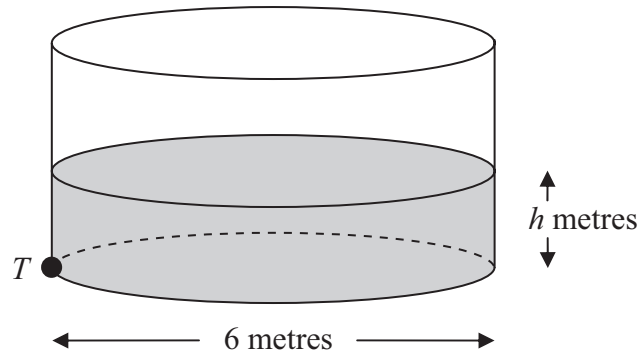


Figure 2

Figure 2 shows a cylindrical water tank. The diameter of a circular cross-section of the tank is 6 m. Water is flowing into the tank at a constant rate of $0.48\pi \text{ m}^3 \text{ min}^{-1}$. At time t minutes, the depth of the water in the tank is h metres. There is a tap at a point T at the bottom of the tank. When the tap is open, water leaves the tank at a rate of $0.6\pi h \text{ m}^3 \text{ min}^{-1}$.

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

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

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

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



Question 8 continued

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Lined area for writing answers to Question 8.

Q8

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

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