**3.**

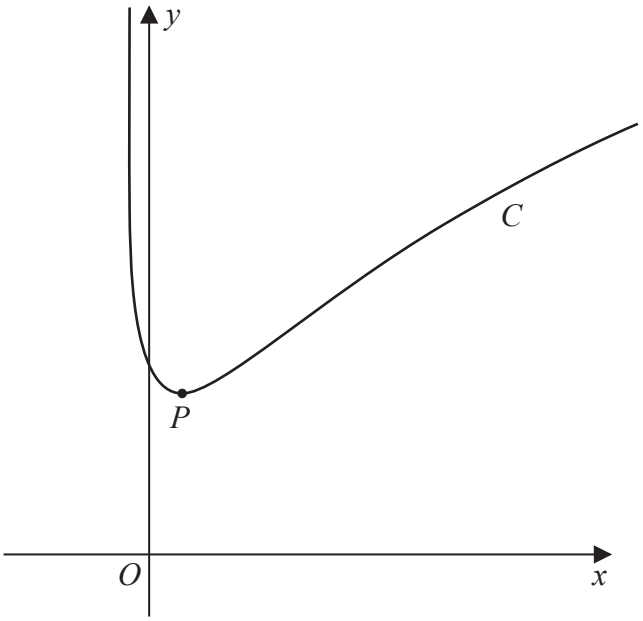



**Figure 1**

The curve $C$, shown in Figure 1, has equation

$$y^2x + 3y = 4x^2 + k \qquad y > 0$$

where $k$ is a constant.

(a) Find $\dfrac{dy}{dx}$ in terms of $x$ and $y$

**(5)**

The point $P(p, 2)$, where $p$ is a constant, lies on $C$.

Given that $P$ is the minimum turning point on $C$,

(b) find

(i) the value of $p$

(ii) the value of $k$

**(4)**

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**Question 3 continued**

**Question 3 continued**

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**Question 3 continued**

**(Total for Question 3 is 9 marks)**

**4.**

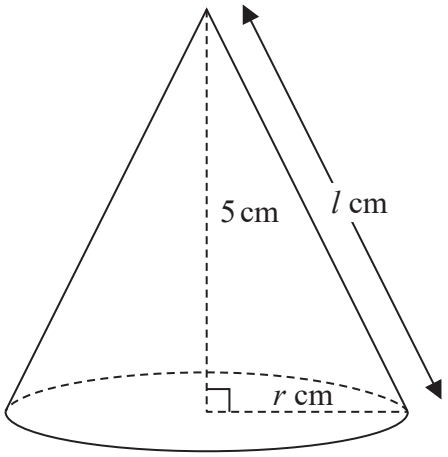



**Figure 2**

A cone, shown in Figure 2, has

- fixed height 5 cm
- base radius $r$ cm
- slant height $l$ cm

(a) Find an expression for $l$ in terms of $r$

**(1)**

Given that the base radius is increasing at a constant rate of 3 cm per minute,

(b) find the rate at which the total surface area of the cone is changing when the radius of the cone is 1.5 cm. Give your answer in $cm^2$ per minute to one decimal place.

[*The total surface area, S, of a cone is given by the formula* $S = \pi r^2 + \pi rl$]

**(4)**

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