**3.** The curve $C$ is defined by the equation

$$8x^3 - 3y^2 + 2xy = 9$$

Find an equation of the normal to $C$ at the point (2, 5), giving your answer in the form $ax + by + c = 0$, where $a$, $b$ and $c$ are integers.

**(7)**

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**Question 3 continued**

**(Total for Question 3 is 7 marks)**

**4.**

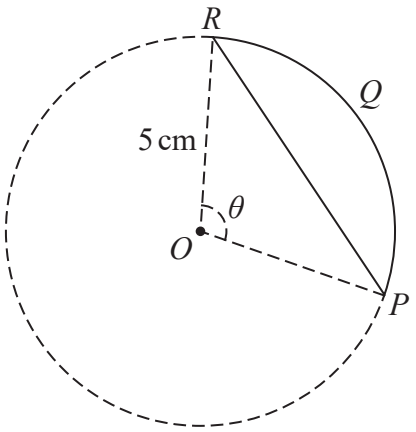



**Figure 1**

Figure 1 shows a sketch of a segment $PQRP$ of a circle with centre $O$ and radius 5 cm.

Given that

- angle $POR$ is $\theta$ radians
- $\theta$ is increasing, from 0 to $\pi$, at a constant rate of 0.1 radians per second
- the area of the segment $PQRP$ is $A\,\text{cm}^2$

(a) show that

$$\frac{\mathrm{d}A}{\mathrm{d}\theta} = K\left(1 - \cos\theta\right)$$

where $K$ is a constant to be found.

**(2)**

(b) Find, in $\text{cm}^2\,\text{s}^{-1}$, the rate of increase of the area of the segment when $\theta = \frac{\pi}{3}$

**(4)**

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