7.

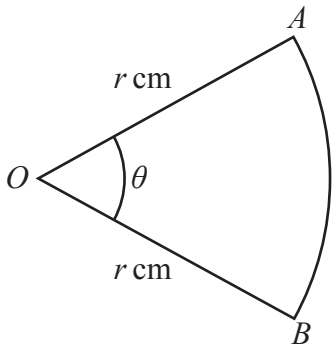

Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows a sector AOB of a circle, centre O.

The radius OA of the sector is r cm and angle AOB is θ radians.

Given that

- the **area** of sector AOB is $1\,\text{cm}^2$
- the **perimeter** of sector AOB is $8\,\text{cm}$

(a) write down two different equations involving r and θ.

(2)

Given that $r > 2$

(b) solve the two simultaneous equations in part (a) to find the exact value of r and the exact value of θ.
Write each answer in the form $a + b\sqrt{c}$ where a, b and c are integers.

(*Solutions relying on calculator technology are not acceptable.*)

(5)

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Question 7 continued

(Total for Question 7 is 7 marks)

8. A curve C has equation $y = \mathrm{f}(x),\ x > 0$

The point P with x coordinate $\frac{1}{4}$ lies on C.

Given that

- $\mathrm{f}'(x) = 10 + \dfrac{5\sqrt{x} - 4}{2x^2}$
- the tangent to C at P has equation $y = kx + 2$, where k is a constant

(a) (i) find the value of k

(ii) find the equation of the normal to C at P.
Give the answer in the form $y = mx + c$, where m and c are constants.

(6)

(b) Find $\mathrm{f}(x)$.

(5)

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