6.

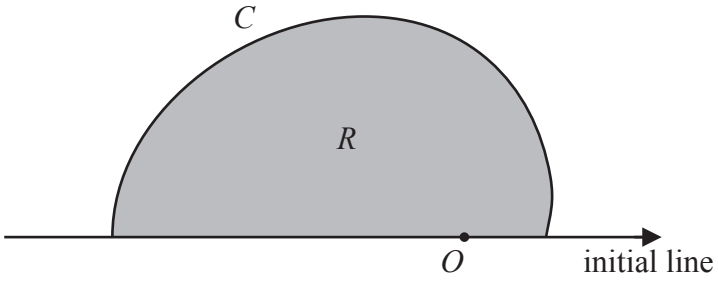


Figure 1

The polar curve C has equation

$$r = k - 2\cos\theta \qquad 0 \leqslant \theta \leqslant \pi$$

where k is a constant and $k > 2$

The region R, shown shaded in Figure 1, is bounded by C, the line with equation $\theta = \pi$ and the initial line.

Given that the area of R is $\left(4 + \sqrt{5}\right)\pi$

(a) use algebraic integration to show that

$$k^2 = 6 + 2\sqrt{5}$$

(4)

The tangent to C at the point P, where $0 < \theta < \pi$, is perpendicular to the initial line.

(b) Use calculus to determine the polar coordinates of P.

(5)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 9 marks)