10.

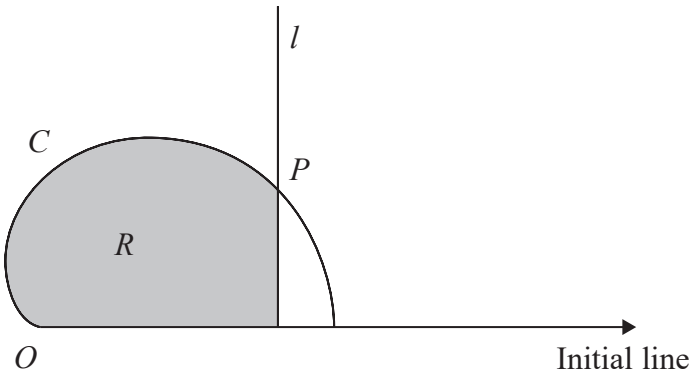


Figure 1

Figure 1 shows a sketch of the curve C with polar equation

$$r = 1 + \cos\theta \qquad 0 \leqslant \theta \leqslant \pi$$

and the line l with polar equation

$$r = k\sec\theta \qquad 0 \leqslant \theta < \frac{\pi}{2}$$

where k is a positive constant.

Given that

- C and l intersect at the point P
- $OP = 1 + \frac{\sqrt{3}}{2}$

(a) determine the exact value of k.

(2)

The finite region R, shown shaded in Figure 1, is bounded by C, the initial line and l.

(b) Use algebraic integration to show that the area of R is

$$p\pi + q\sqrt{3} + r$$

where p, q and r are simplified rational numbers to be determined.

(7)

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Question 10 continued

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(Total for Question 10 is 9 marks)

TOTAL FOR PAPER IS 75 MARKS

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