9.

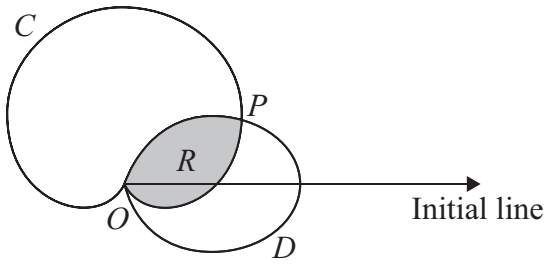


Figure 1

In this question you must show all stages of your working.
Solutions relying entirely on calculator technology are not acceptable.

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

$$r = 1 + \sin\theta \qquad -\frac{\pi}{2} \leqslant \theta \leqslant \frac{3\pi}{2}$$

and a sketch of the curve D with polar equation

$$r = 1 + \cos 2\theta \qquad -\frac{\pi}{2} \leqslant \theta \leqslant \frac{\pi}{2}$$

The curves intersect at the pole O and at the point P as shown.

(a) Determine the polar coordinates of P.

(3)

The finite region R, shown shaded in Figure 1, is bounded by C and D.

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

$$a\pi + b\sqrt{3}$$

where a and b are rational numbers to be determined.

(6)

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Question 9 continued

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Question 9 continued

Question 9 continued

(Total for Question 9 is 9 marks)

TOTAL FOR PAPER IS 75 MARKS

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