

4.

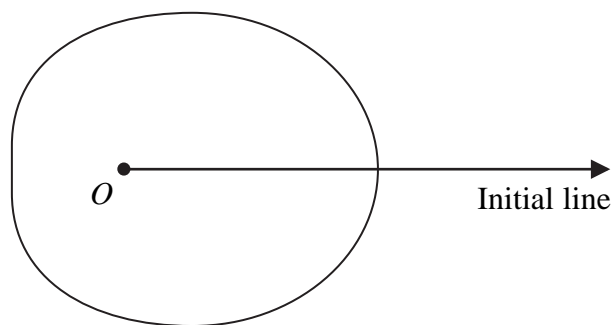
**Figure 1**

Figure 1 shows a sketch of the curve with polar equation

$$r = a + 3 \cos \theta, \quad a > 0, \quad 0 \leq \theta < 2\pi$$

The area enclosed by the curve is $\frac{107}{2} \pi$.

Find the value of a .

(8)

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Question 4 continued

Handwriting practice area with horizontal lines.



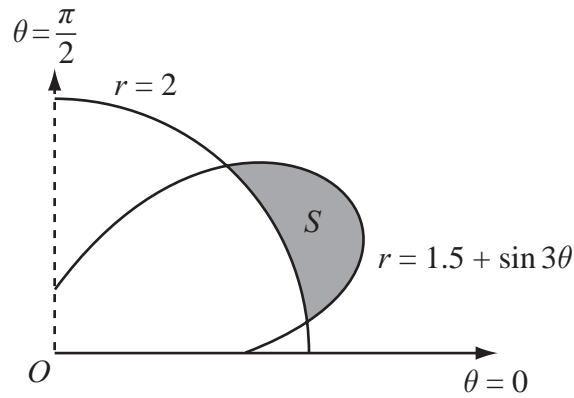


Figure 1 shows the curves given by the polar equations

$$r = 2, \quad 0 \leq \theta \leq \frac{\pi}{2},$$

and $r = 1.5 + \sin 3\theta$, $0 \leq \theta \leq \frac{\pi}{2}$.

- (3)

The region S , between the curves, for which $r > 2$ and for which $r < (1.5 + \sin 3\theta)$, is shown shaded in Figure 1.

- (7)

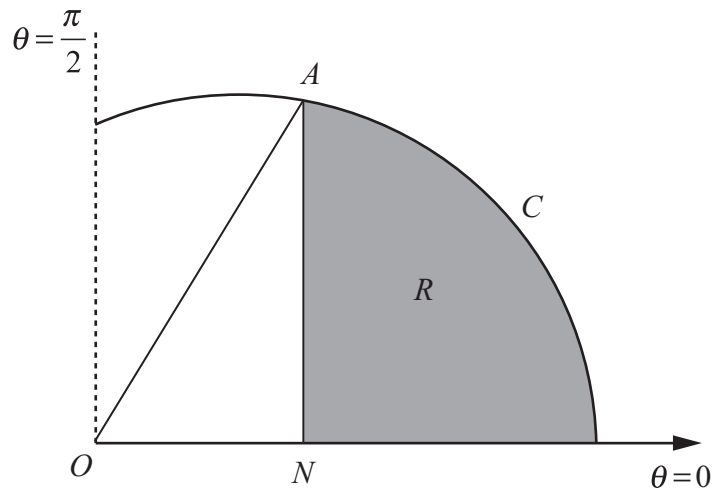
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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Question 5 continued

Lined area for writing the answer to Question 5.





The curve C shown in Figure 1 has polar equation

$$r = 2 + \cos \theta, \quad 0 \leq \theta \leq \frac{\pi}{2}$$

At the point A on C , the value of r is $\frac{5}{2}$.

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

Find the exact area of the shaded region R .

(9)

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Question 6 continued

Lined area for writing the answer to Question 6.



2. The curve C has polar equation

$$r = 1 + 2\cos\theta, \quad 0 \leq \theta \leq \frac{\pi}{2}$$

At the point P on C , the tangent to C is parallel to the initial line.

Given that O is the pole, find the exact length of the line OP .

(7)

