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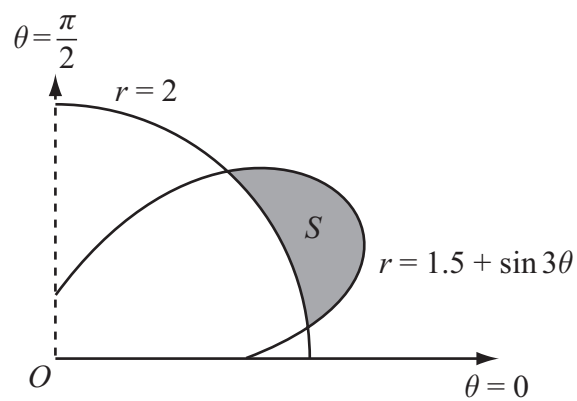


Figure 1

Figure 1 shows the curves given by the polar equations

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

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

- (a) Find the coordinates of the points where the curves intersect. (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.

- (b) Find, by integration, the area of the shaded region  $S$ , giving your answer in the form  $a\pi + b\sqrt{3}$ , where  $a$  and  $b$  are simplified fractions. (7)

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6. A complex number  $z$  is represented by the point  $P$  in the Argand diagram.

(a) Given that  $|z-6|=|z|$ , sketch the locus of  $P$ . (2)

(b) Find the complex numbers  $z$  which satisfy both  $|z-6|=|z|$  and  $|z-3-4i|=5$ . (3)

The transformation  $T$  from the  $z$ -plane to the  $w$ -plane is given by  $w = \frac{30}{z}$ .

(c) Show that  $T$  maps  $|z-6|=|z|$  onto a circle in the  $w$ -plane and give the cartesian equation of this circle. (5)























