







Leave blank

2.

$$z = 5\sqrt{3} - 5i$$

Find

(a)  $|z|$ ,

(1)

(b)  $\arg(z)$ , in terms of  $\pi$ .

(2)

$$w = 2\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$$

Find

(c)  $\left|\frac{w}{z}\right|$ ,

(1)

(d)  $\arg\left(\frac{w}{z}\right)$ , in terms of  $\pi$ .

(2)

Multiple horizontal lines for writing answers.







Leave blank

Question 3 continued

Lined writing area for the answer to Question 3.

(Total 5 marks)

Q3



Leave blank

4. (a) Given that

$$z = r(\cos \theta + i \sin \theta), \quad r \in \mathbb{R}$$

prove, by induction, that  $z^n = r^n (\cos n\theta + i \sin n\theta)$ ,  $n \in \mathbb{Z}^+$

(5)

$$w = 3 \left( \cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4} \right)$$

(b) Find the exact value of  $w^5$ , giving your answer in the form  $a + ib$ , where  $a, b \in \mathbb{R}$ .

(2)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---









Leave  
blank

Question 4 continued

Handwritten area with horizontal lines for writing answers to Question 4.

(Total 7 marks)

Q4





Leave  
blank

**Question 5 continued**

Blank lined area for writing answers.



P 4 3 1 4 9 A 0 1 3 2 8



Leave  
blank

**Question 5 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

**(Total 12 marks)**

**Q5**

--	--









Leave  
blank

### Question 6 continued

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---







Leave  
blank

**Question 7 continued**

A series of horizontal lines provided for writing the answer to Question 7.





Leave  
blank

**Question 7 continued**

A series of 30 horizontal lines for writing the answer to Question 7.

(Total 13 marks)

Q7

--	--



8.

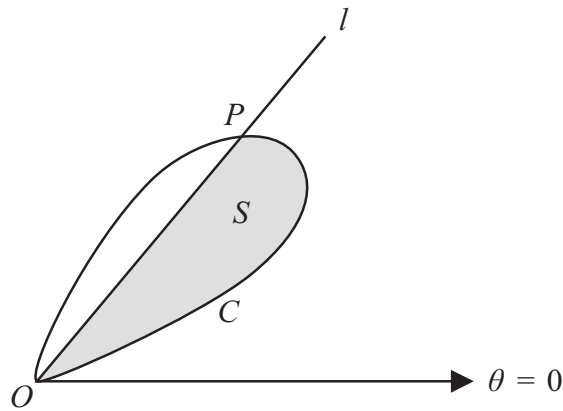


Figure 1

Figure 1 shows a curve  $C$  with polar equation  $r = a \sin 2\theta$ ,  $0 \leq \theta \leq \frac{\pi}{2}$ , and a half-line  $l$ .

The half-line  $l$  meets  $C$  at the pole  $O$  and at the point  $P$ . The tangent to  $C$  at  $P$  is parallel to the initial line. The polar coordinates of  $P$  are  $(R, \phi)$ .

(a) Show that  $\cos \phi = \frac{1}{\sqrt{3}}$  (6)

(b) Find the exact value of  $R$ . (2)

The region  $S$ , shown shaded in Figure 1, is bounded by  $C$  and  $l$ .

(c) Use calculus to show that the exact area of  $S$  is

$$\frac{1}{36} a^2 \left( 9 \arccos \left( \frac{1}{\sqrt{3}} \right) + \sqrt{2} \right) \quad (7)$$

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---





Leave  
blank

**Question 8 continued**

Lined writing area for the answer to Question 8.



Leave  
blank

Question 8 continued

Ruled area for writing the answer to Question 8.



Leave  
blank

Question 8 continued

Lined writing area for the answer.



Leave  
blank

**Question 8 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

**Q8**

(Total 15 marks)

**TOTAL FOR PAPER: 75 MARKS**

**END**

