**MATHEMATICS SPECIALIST 3 & 4** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Test 2 2018**

**Section One: Calculator Free**

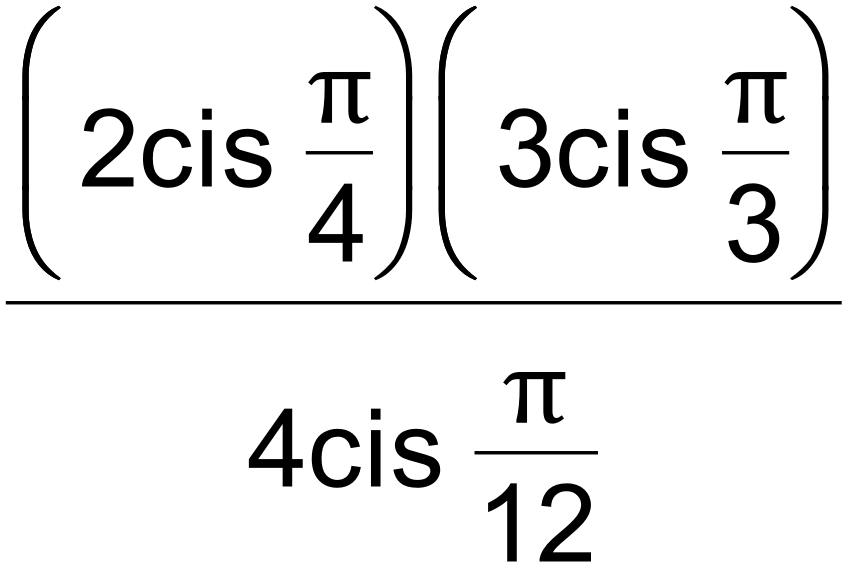
Reading Time: 2 minutes

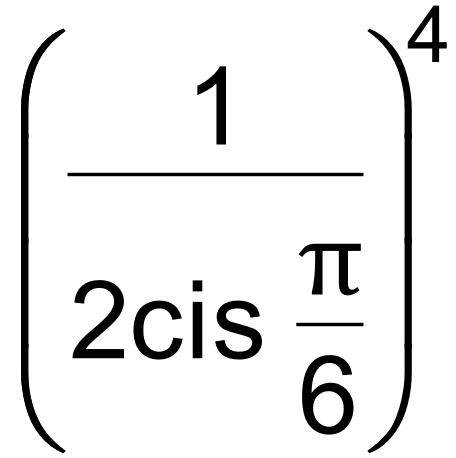
Time Allowed: 28 minutes Total Marks: 26

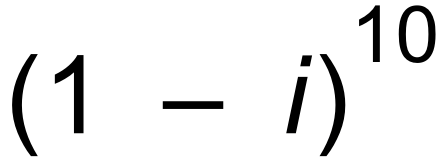
**Question 1 (9 marks)**

Give exact expressions for each of the following in the form a + bi.

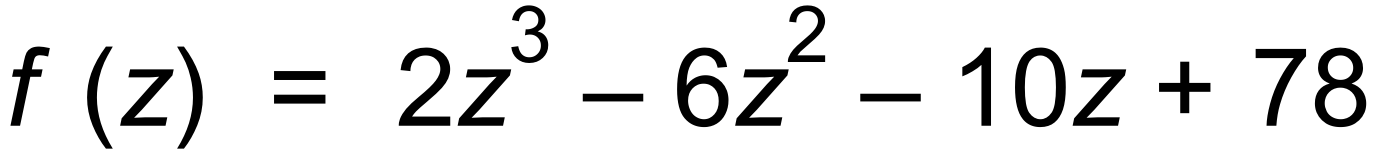
(a) . (2 marks)

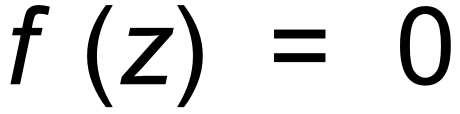
(a)  (2 marks)

(b)  (2 marks)

(c)  (3 marks)

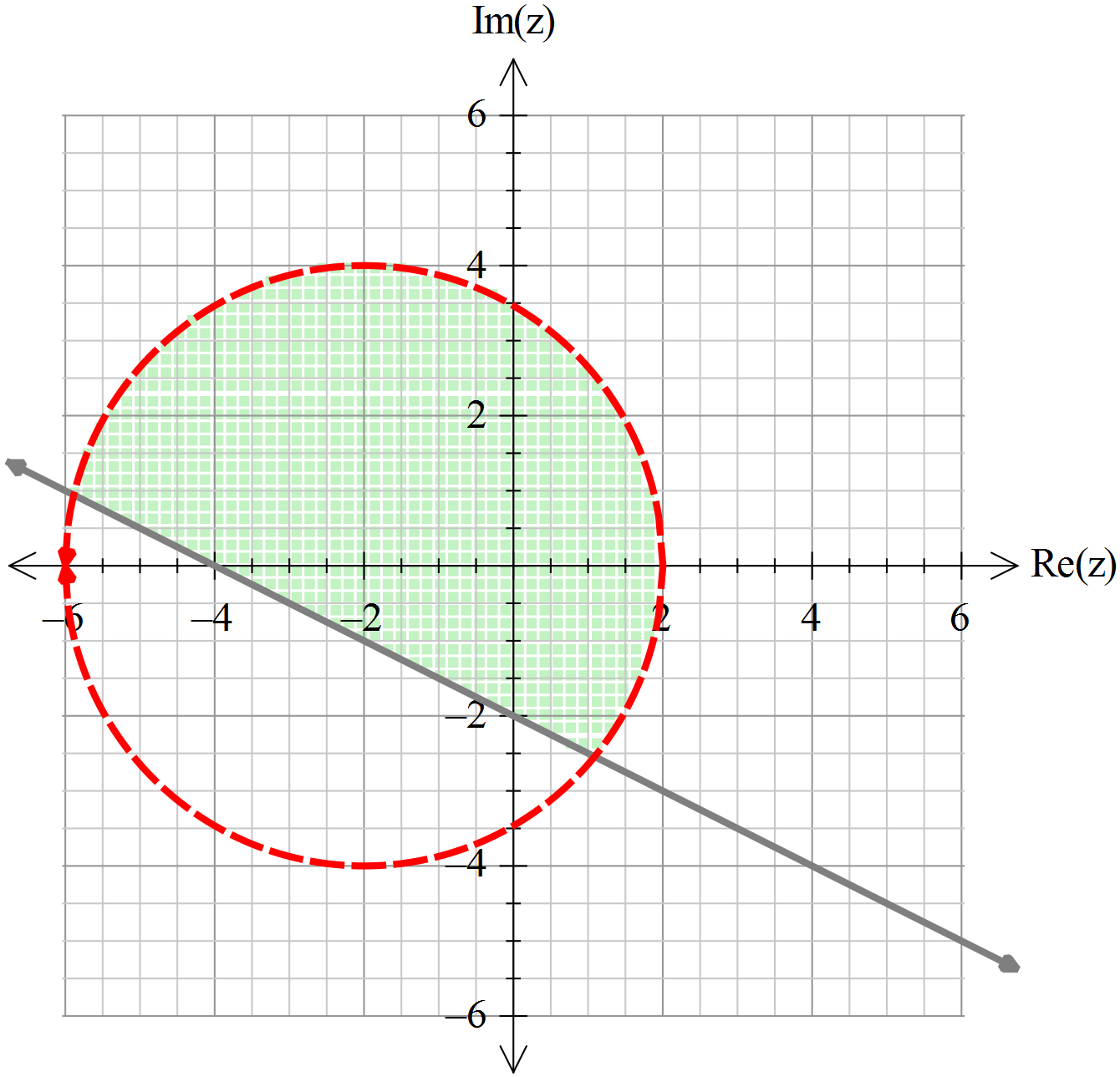
**Question 2 (4 marks)**

Consider .

Solve , if we know that f (−3) = 0. (4 marks)

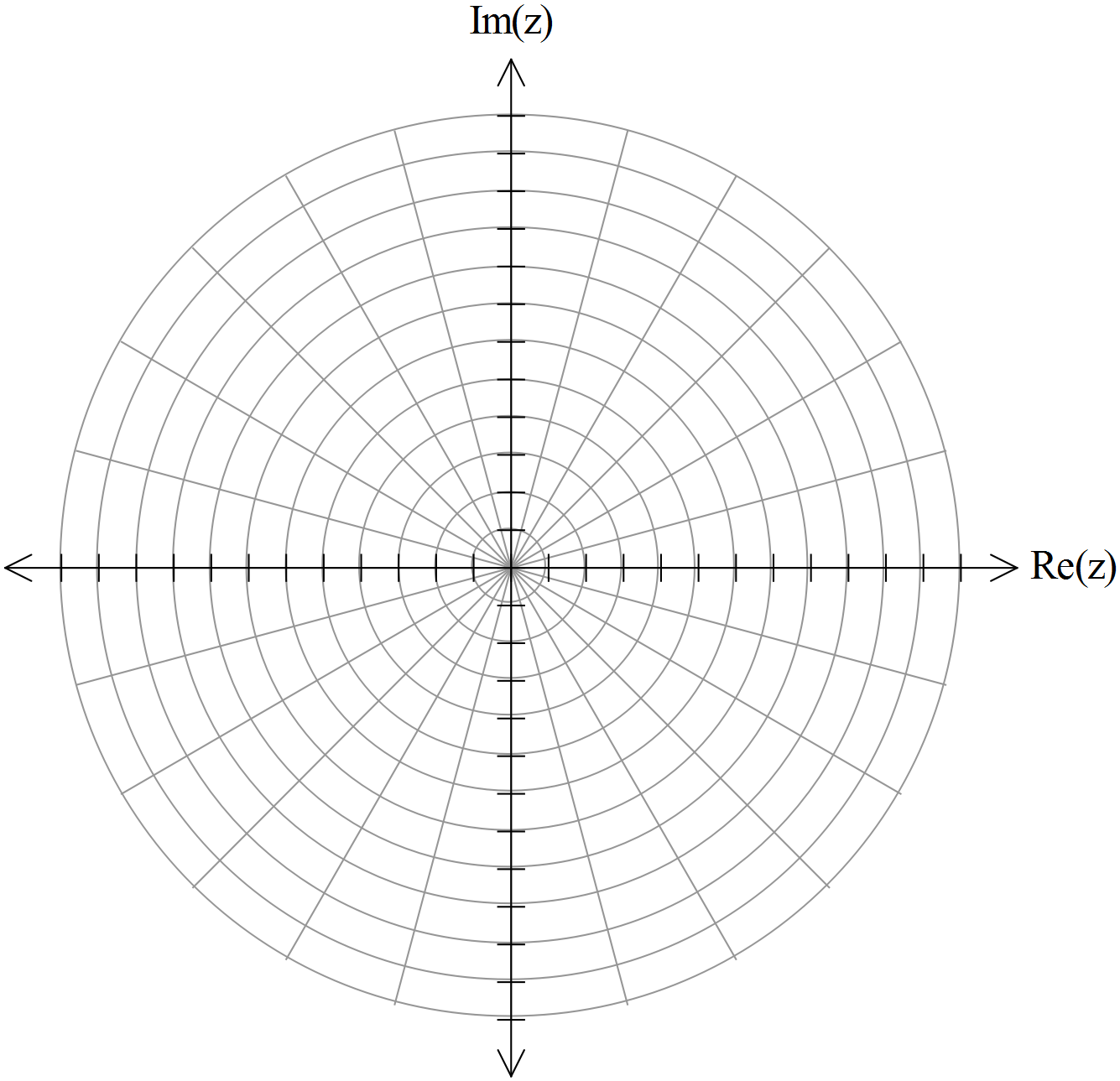
**Question 3 (4 marks)**

State a symbolic description for the set of points indicated by the shaded region on the graph drawn below.



**Question 4 (5 marks)**

Determine the 5th roots of  and plot them on the Argand plane provided below.



**End of Questions**

**Question 5 (4 marks)**

Let Consider .

Determine the possible value(s) for .

**MATHEMATICS SPECIALIST 3 & 4** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Test 2 2018**

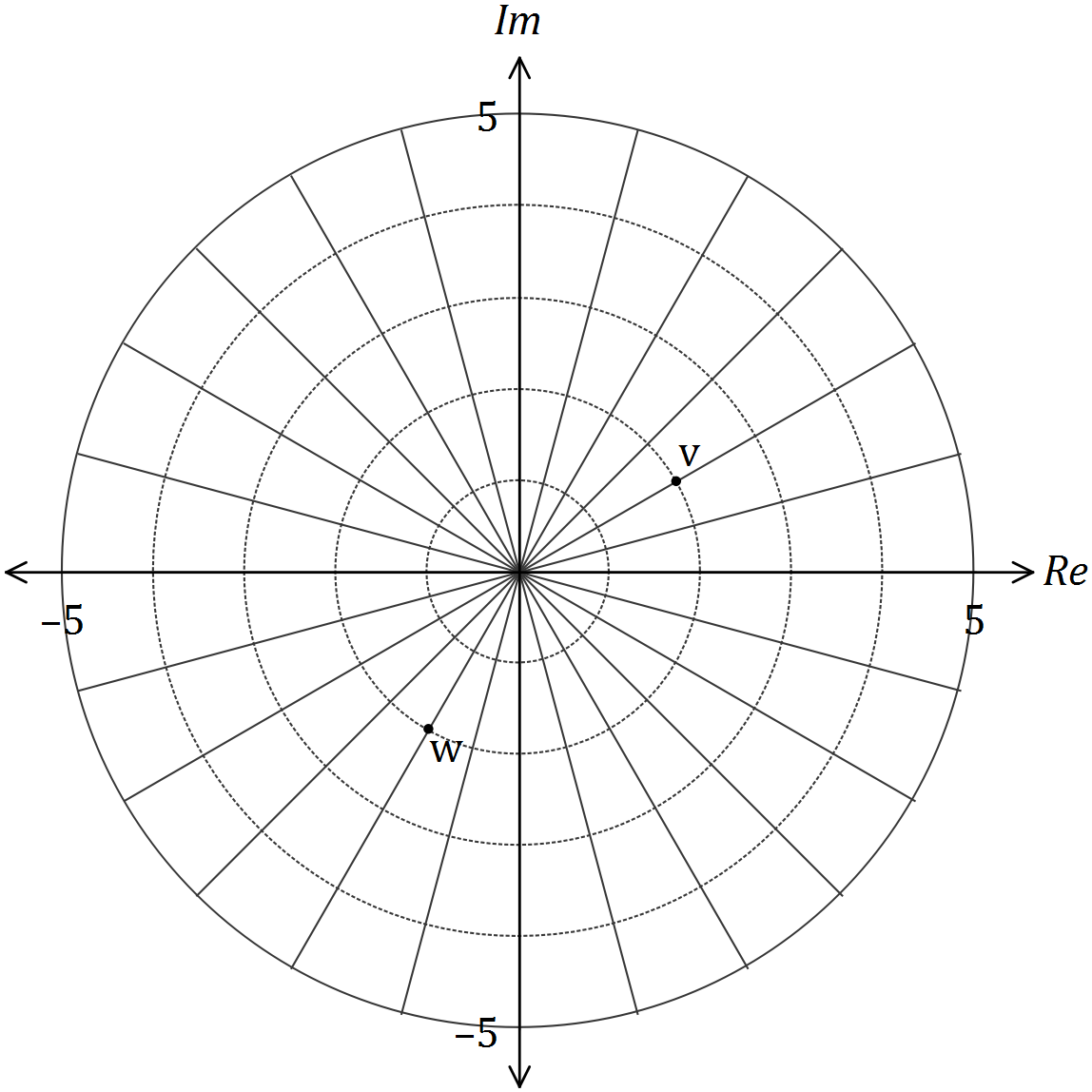
**Section One: Calculator Assumed**

Reading Time: 2 minutes

Time Allowed: 35 minutes Total Marks: 33

**Question 6 (6 marks)**

The complex numbers and are shown on the Argand diagram below.



On the diagram, clearly mark the complex numbers

(a) . (2 marks)

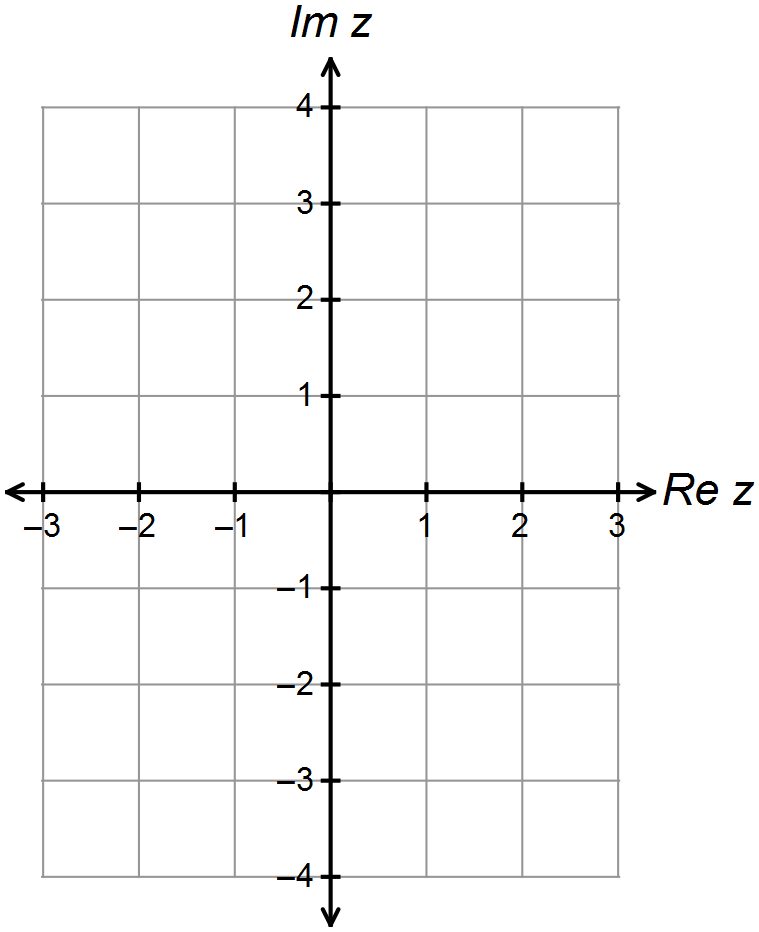
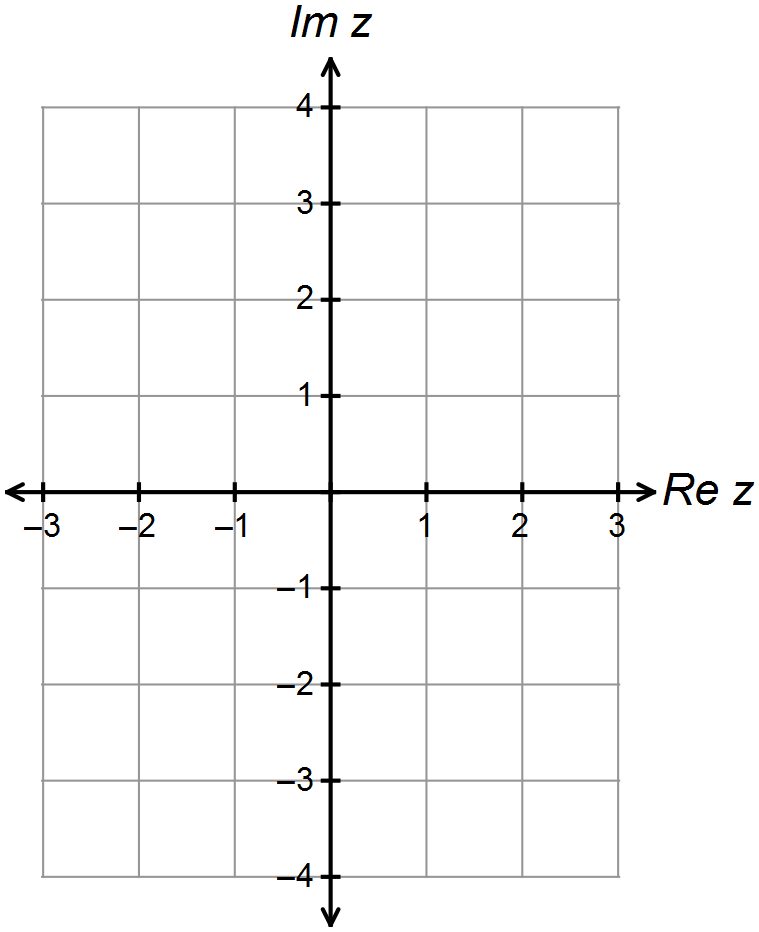
(b) . (2 marks)

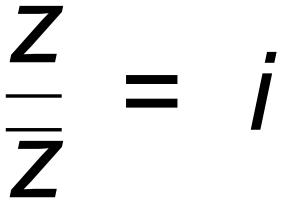
(c) . (2 marks)

**Question 7 (8 marks)**

On the axes below sketch the locus of the complex number z = x + yi, given by:

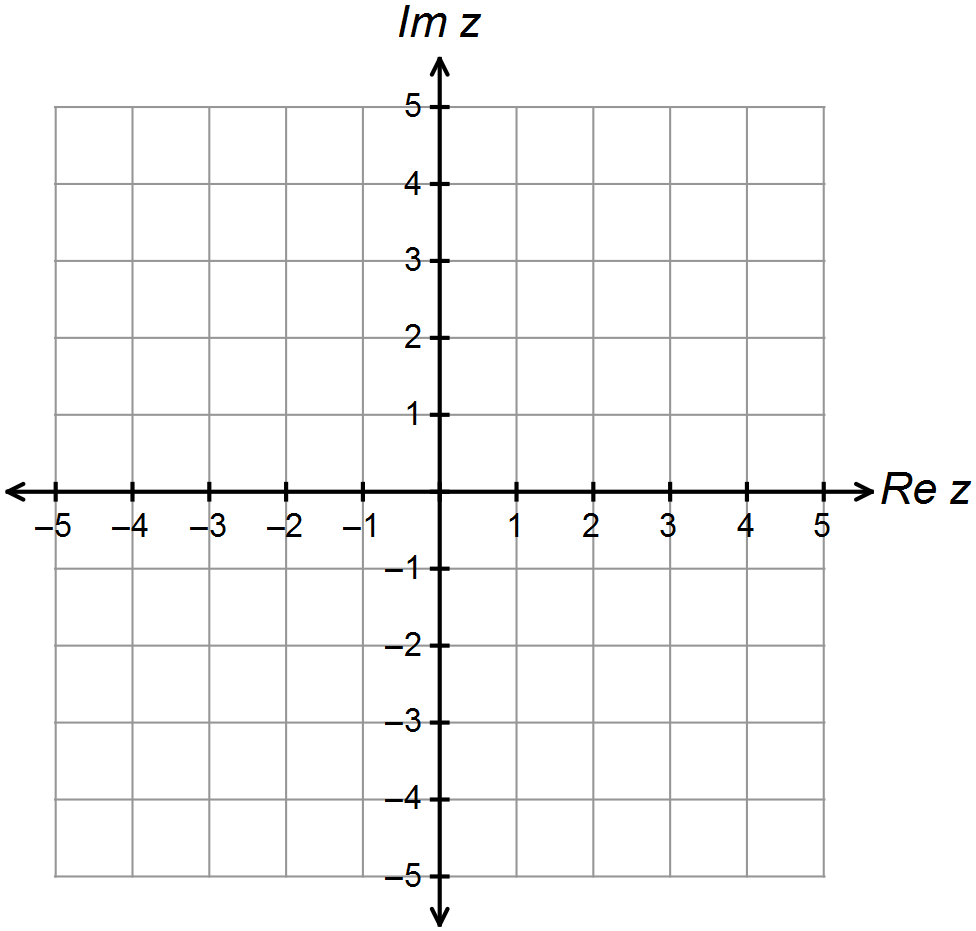
(a) | z + 1 − 2i | ≤ 1 and | z + i | ≥ | z − (2 + i) | . (4 marks)



(b)  . (2 marks)

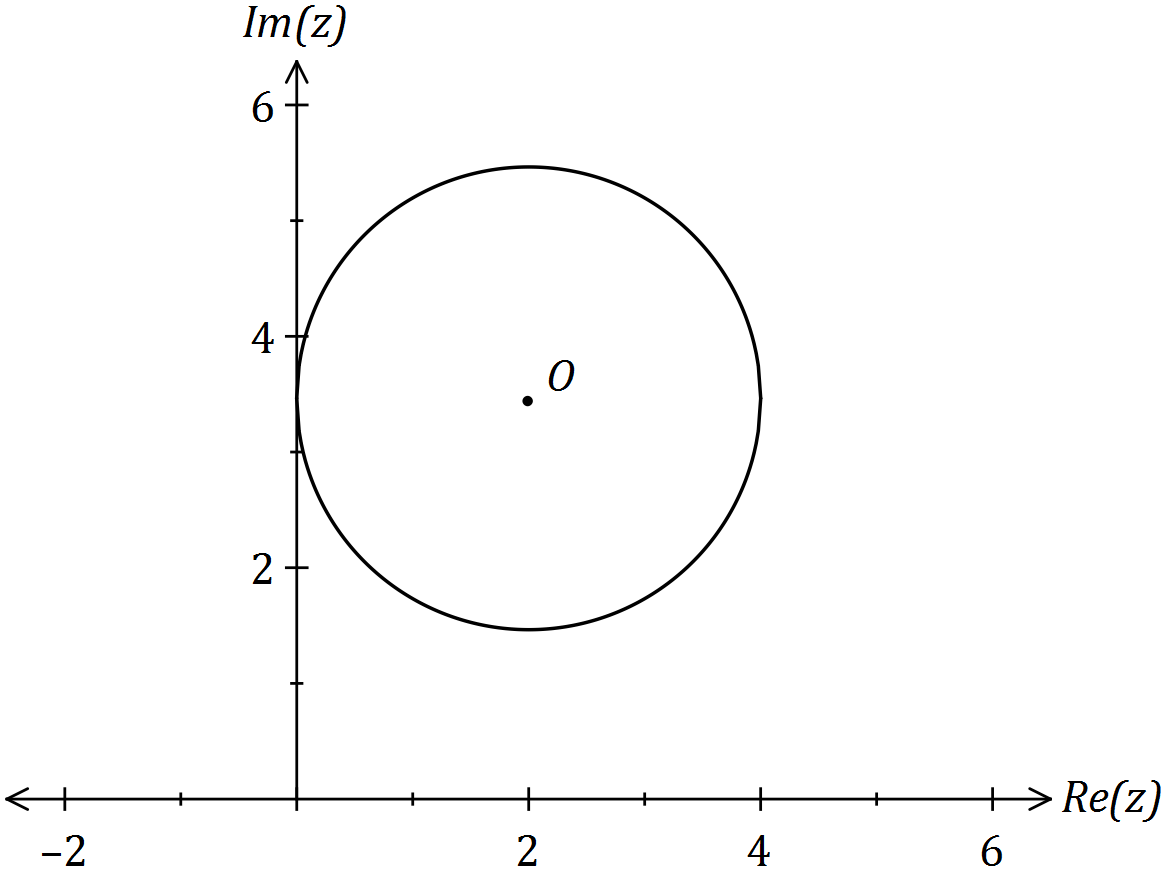
(c) Given that a = 1 + 2i and b = 3 + 4i, sketch on the complex plane below;

{ z : | z − a | + | z − b | = | a − b | }. (2 marks)



**Question 8 (5 marks)**

The subset of the complex plane, z, is a circle with centre shown below.



(i) Mark the position in the plane where is maximised. Label this point (i).

(1 mark)

(ii) Mark the position in the plane where is minimised. Label this point (ii).

(1 mark)

(iii) If the subset shown is , determine the maximum and minimum values of . (3 marks)

**Question 9 (8 marks)**

Consider the complex number and the expansion of .

(a) Use De Moivre’s theorem to express in terms of . (5 marks)

(b) Use your result in (a) to solve the equation . (3 marks)

**Question 10 (6 marks)**

Given  , determine .