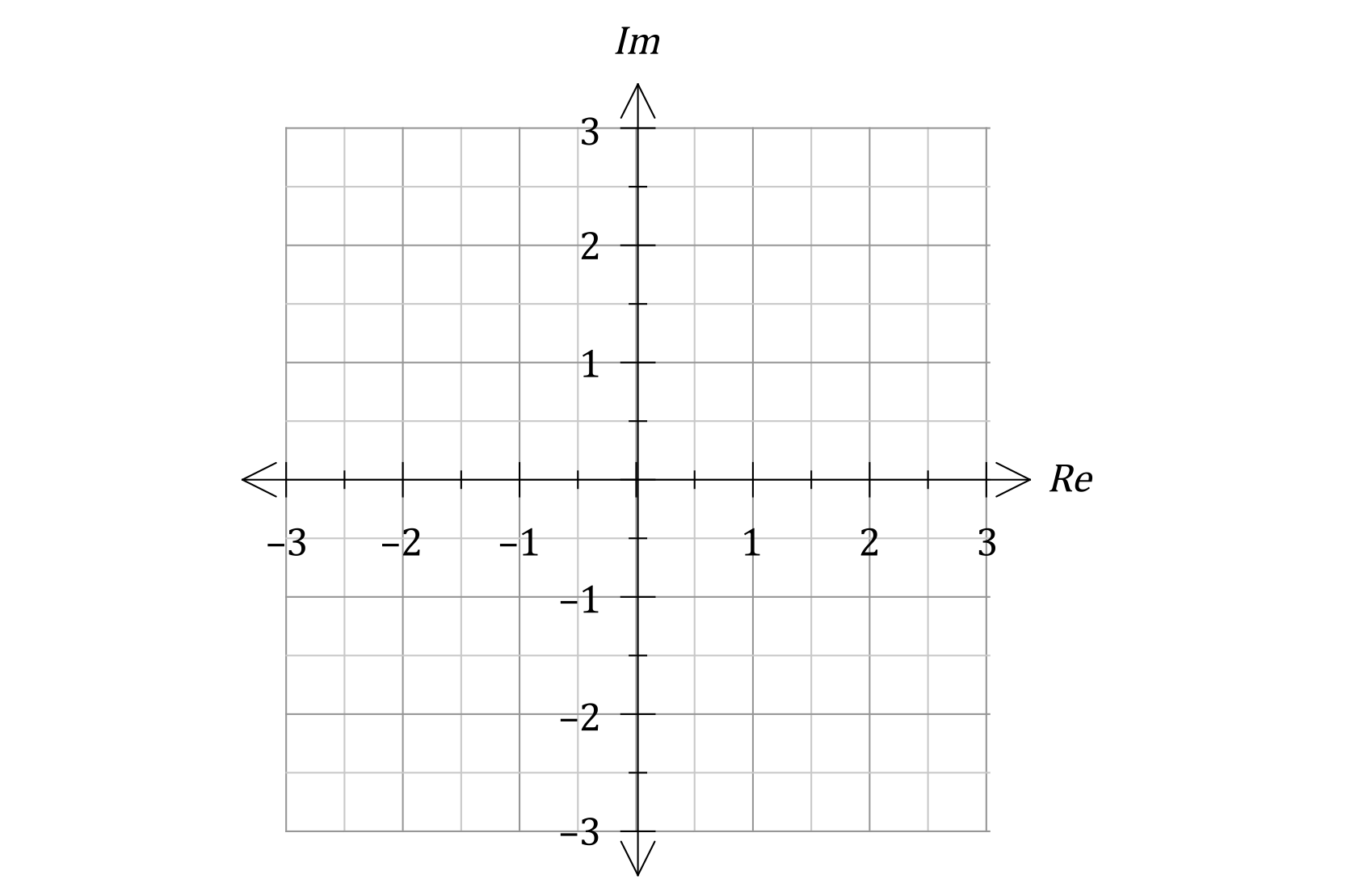
|  |  |
| --- | --- |
|  | **MATHEMATICS SPECIALIST 3 & 4**  **SEMESTER 1 2019**  **TEST 2**  **Calculator Free** |

Reading Time: 2 minutes Time Allowed: 21 minutes

Total Marks: 21

**Question 1 (2 marks)**

Sketch the set of points z, in the complex plane, that satisfy the equation

|  |
| --- |
|  |

**Question 2 (4 marks)**

Evaluate (1 + i)7 + (1 – i)7 using de Moivre’s rule.

**Question 3 (9 marks)**

1. Let be any complex number. (3 marks)

Obtain an equation relating given that Re=0.

1. Let be any complex number. Obtain an expression for:
2. (3 marks)
3. (3 marks)

**Question 4 (6 marks)**

1. Solve the equation giving solutions in polar form . (3 marks)

It can be shown that can be written in the form

.

(b) Determine . (1 mark)

(c) Hence solve the equation giving all solutions in Cartesian form . (2 marks)

|  |  |
| --- | --- |
|  | **MATHEMATICS SPECIALIST 3 & 4**  **SEMESTER 1 2019**  **TEST 2**  **Calculator Assumed** |

Reading Time: 2 minutes Time Allowed: 35 minutes

Total Marks: 31

Question 5 (6 marks)

Two complex numbers are and .

(a) Determine the argument of . (2 marks)

(b) Simplify . (2 marks)

(c) Determine in polar form if . (2 marks)

Question 6 (8 marks)

(a) Let be a point in the complex plane. Determine, in terms of and , the polar form of this point after it is rotated by about the origin and then reflected in the real axis.

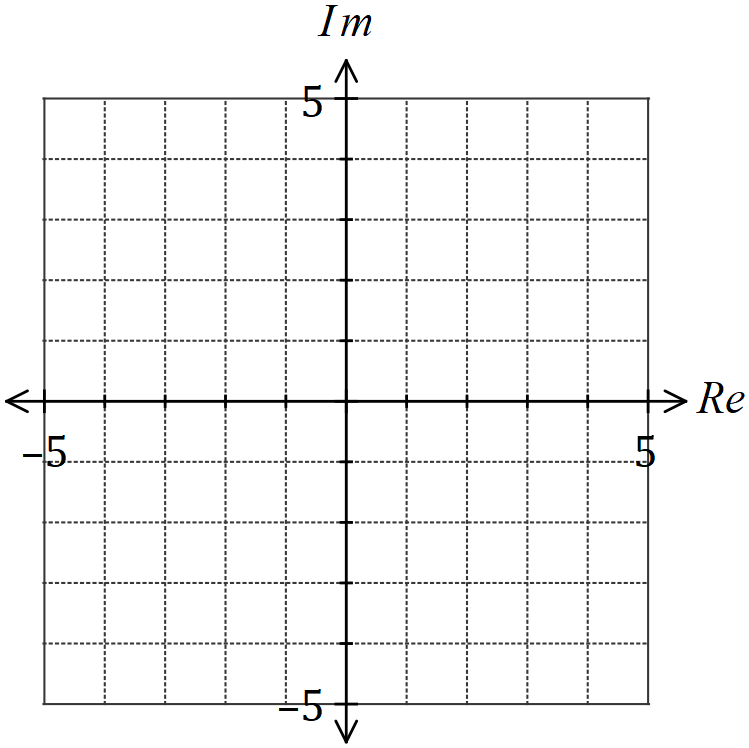
(2 marks)

(b) Let .

(i) Complete the following table. (3 marks)

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |

(ii) Sketch each point, , and join it with a dotted line to its image, , on the diagram below. (1 mark)

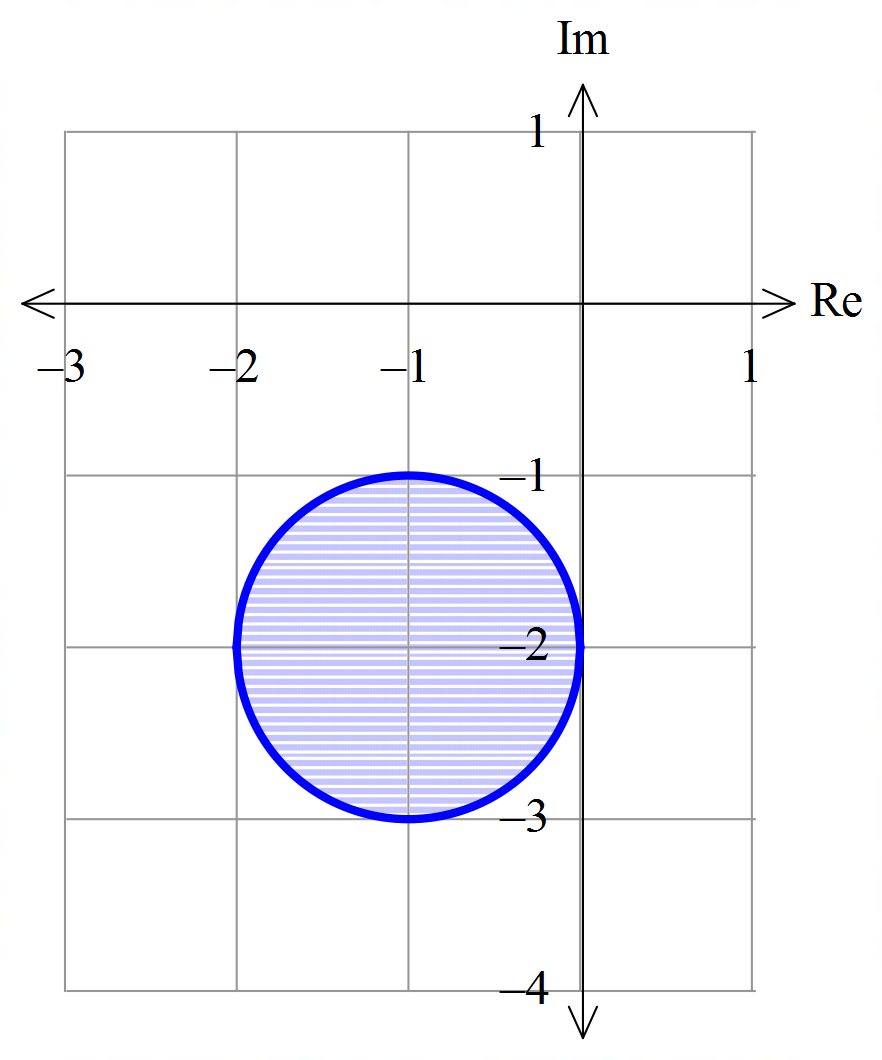


(iii) Describe the geometric transformation that represents. (2 marks)

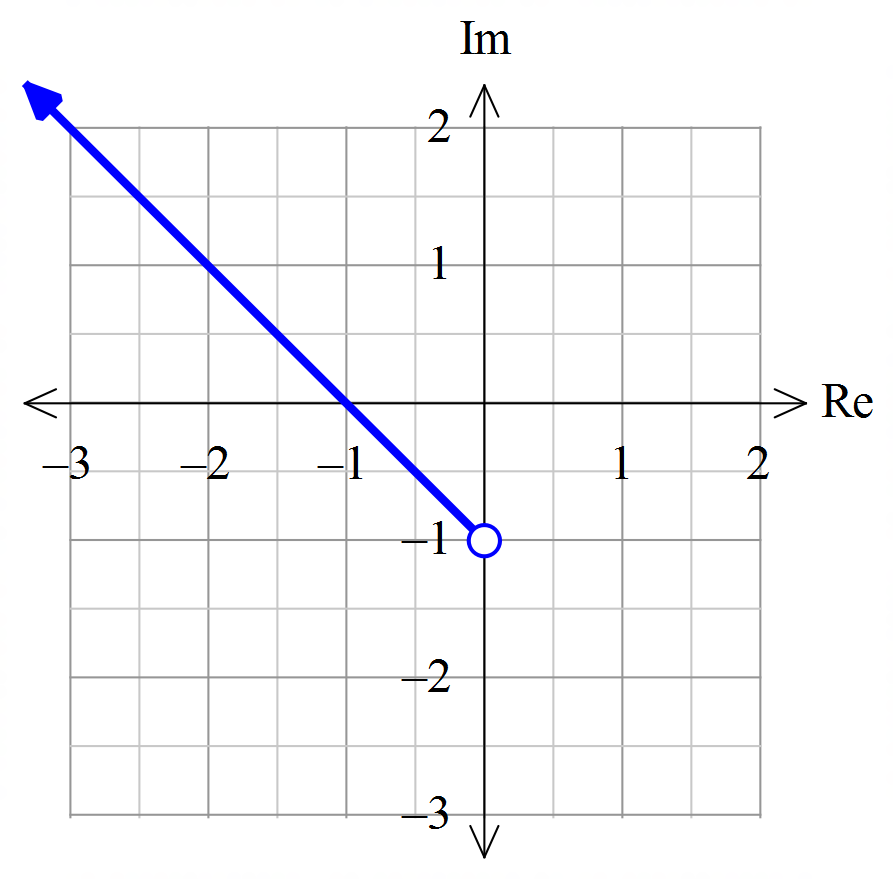
**Question 7 (8 marks)**

A sketch of the locus of a complex number is shown below. Write equations or inequalities in terms of (without using Re or Im) for each of the following:

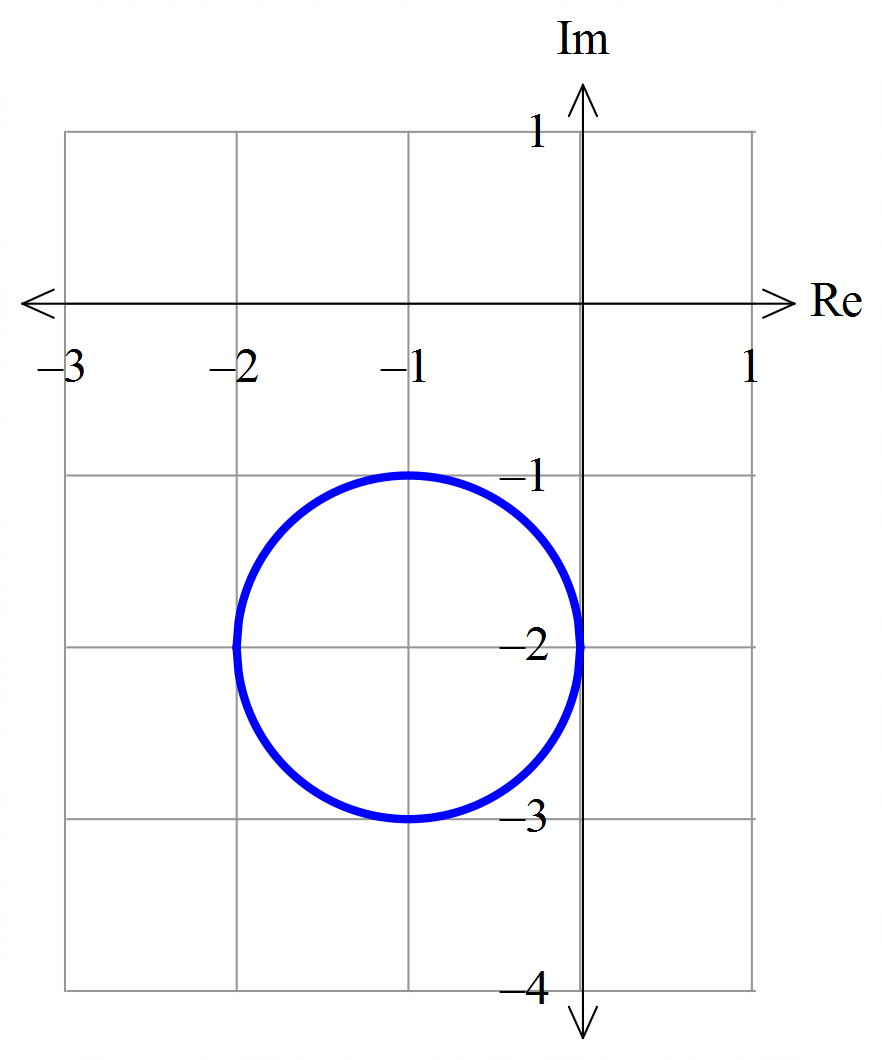
1. (3 marks)



1. (2 marks)



The sketch in (a) is repeated below, with only the circle indicated.



1. From the locus from part(a), determine the minimum value for correct to 0.01, where

. (3 marks)

**Question 8 (9 marks)**

1. Use De Moivre’s theorem to establish the identity

 . (4 marks)

(b) Determine the maximum and minimum values of



on the interval and the values of at these extremes.

(Hint: Let and use the identity in part (a).) (5 marks)