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**West Coast Collaborative**

**Specialist Mathematics Units 3 & 4**

**Test 1 2018**

**Calculator Free Section**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_ / 20**

**Time Allowed**: 20 minutes **Total Marks**: 20

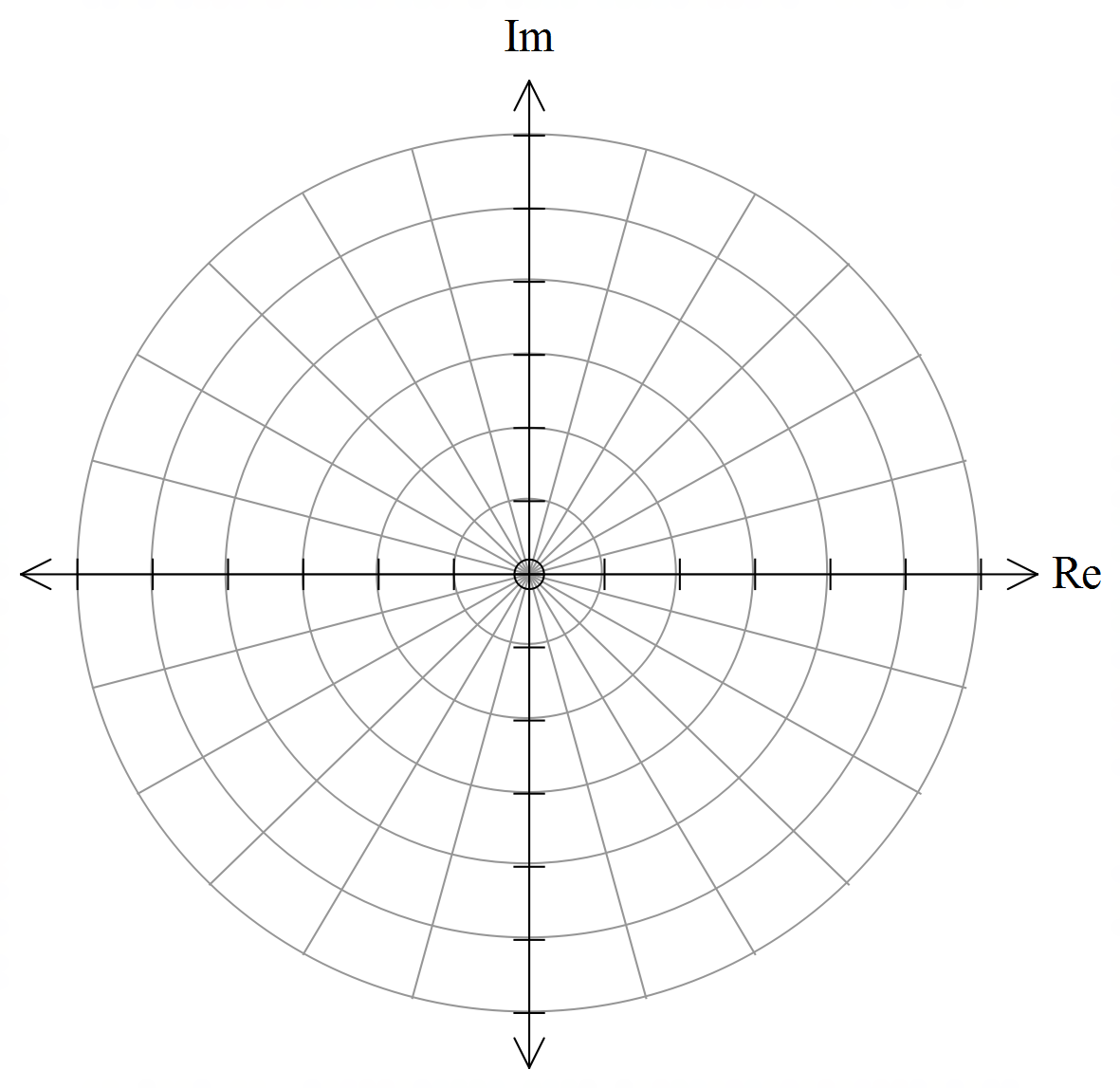
**Materials Allowed**: SCSA formula booklet

**Instructions:** Where a question or part of a question is worth more than 2 marks sufficient working to justify your solution is required.

1. **[7, 1, 2, 1 marks]**

One of the three cube roots of a complex number ***Z*** is , where .

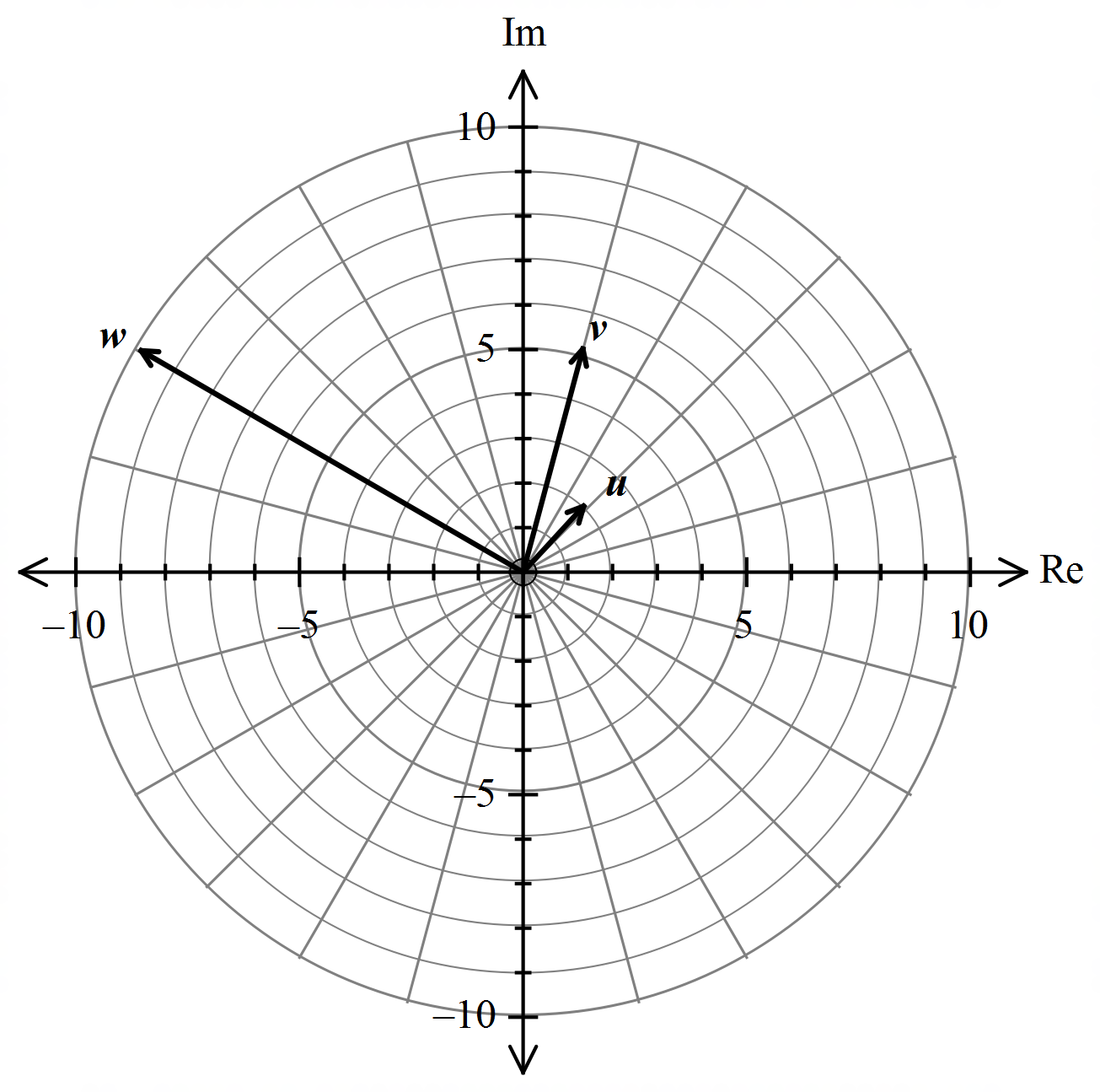
1. On the Argand plane, accurately sketch the 3 cube roots of ***Z.***



1. Determine as exact values:
   1. in polar form
   2. ***Z*** in polar form
2. **[4 marks]**

The diagram below shows the unit circle in the complex plane and the position of three complex numbers

***w****,* ***u***and ***v***.



On the diagram above plot the following:

a.

b.

c.

d.

1. **[5 marks]**

The polynomial has a factor of and leaves a remainder of 51 when is divided by . Determine the values of *a* and *b*.

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**Specialist Mathematics Units 3 & 4**

**Test 1 2018**

**Calculator Assumed Section**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_ / 36**

**Time Allowed**: 35 minutes **Total Marks**: 36

**Materials Allowed**: SCSA formula booklet, SCSA approved calculators and one A4 page of notes (both sides).

**Instructions:** Where a question or part of a question is worth more than 2 marks sufficient working to justify your solution is required.

1. **[6 marks]**

Solve the equation .

1. **[3, 3 marks]**

**a.** Given , prove that

b. Hence, show that

1. **[4, 4 marks]**

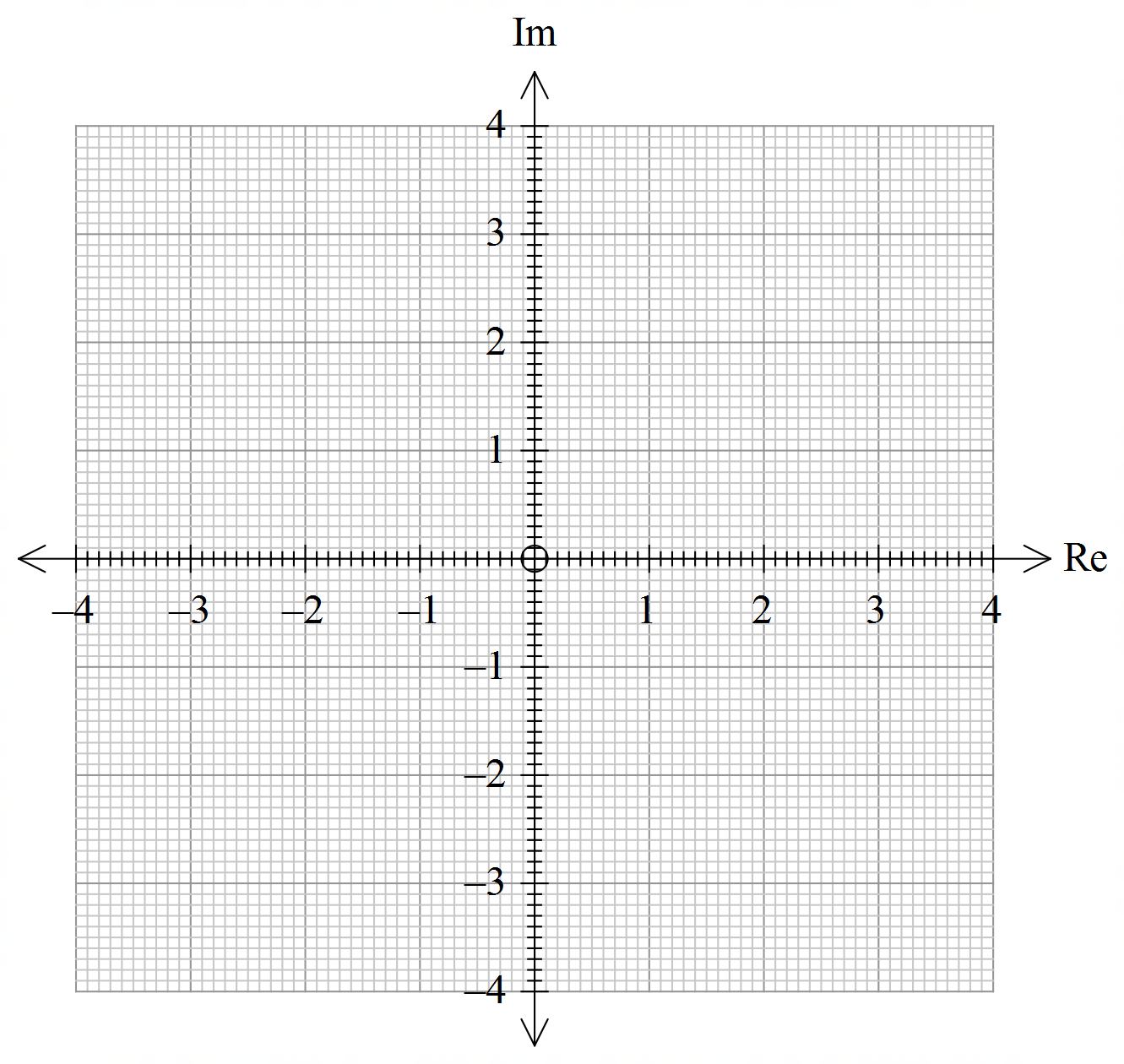
Two complex numbers are given by and

a. Express in the form , where and .

b. Use de Moivre’s theorem to determine all the solutions for in polar form, given .

1. **[5, 2 marks]**

a. Sketch in the complex plane the region satisfying the two inequalities given by



b. If *z* is the complex number that satisfies both inequalities in part **a**, determine the minimum and maximum values of .

1. **[3 marks]**

Use de Moivre’s theorem to prove

1. **[6 marks]**

Determine the centre and radius of the circle described by *z,*  where .

Hint: Investigate the Cartesian equation by letting .