School of Rock

Mathematics Department

Specialist Mathematics

2022

Task 1

Question booklet

- Answer **all** questions
- Write your answers in this question booklet
- Allow approximately 70 minutes
- Approved calculators may be used

Examination information

Materials

- Question booklet
- Formula sheet

Instructions

- Show appropriate working and steps of logic in the question booklets
- State all answers correct to three significant figures, unless otherwise instructed
- Use black or blue pen
- You may use a sharp dark pencil for diagrams

Total time: 70 minutes
Total marks: 60

Student Name: ..... Teacher: .....

Question 1 (6 marks)

(a) Write $-1 + i\sqrt{3}$ in $r \operatorname{cis} \theta$ form.

(1 mark)

(b) Consider the complex number $z_1 = x + iy$, where $x > 0$, $y > 0$, and $x > y$.

The complex number z_1, which lies in the first quadrand of the Argand diagram, is shown in Figure 1.

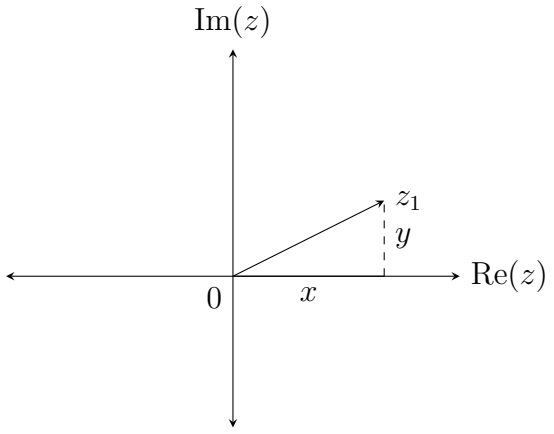

Figure 1

i. Let $z_1 = (-1 + i\sqrt{3})z_1$.

Using part (a), show that $|z_2| = 2|z_1|$.

(1 mark)

ii. On the Argand diagram in Figure 1, draw z_2.

(2 marks)

(c) Use the triangle inequality to show that $|z_1 - z_2| < 3|z_1|$.

(2 marks)