Lesson 19: Exploiting the Connection to Trigonometry

Classwork

Opening Exercise

A polar grid is shown below. The grid is formed by rays from the origin at equal rotation intervals and concentric circles centered at the origin. The complex number is graphed on this polar grid.



* 1. Use the polar grid to identify the modulus and argument of .
	2. Graph the next three powers of on the polar grid. Explain how you got your answers.
	3. Write the polar form of the number in the table below, and then rewrite it in rectangular form.

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| --- | --- | --- |
| **Power of**  | **Polar Form** | **Rectangular Form** |
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|  |  |  |
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Exercises 1–3

The complex numbers and are graphed below.



1. Use the graph to help you write the numbers in polar and rectangular form.
2. Describe how the modulus and argument of are related to the modulus and argument of
.
3. Why could we call a square root of ?

**Example 1: Find the Two Square Roots of a Complex Number**

Find both of the square roots of .

Exercises 4–6

1. Find the cube roots of .
2. Find the square roots of .
3. Find the cube roots of .

Lesson Summary

Given a complex number with modulus and argument , the th roots of are given by

for integers and such that and .

Problem Set

1. For each complex number what is ?
2. For each complex number, what are the square roots of ?
	1.
	2.



1. For each complex number, graph , , and on a polar grid.
2. What are the cube roots of
3. What are the fourth roots of
4. What are the square roots of ?
5. Find the square roots of . Show that the square roots satisfy the equation.
6. Find the cube roots of . Show that the cube roots satisfy the equation .