Lesson 9: The Geometric Effect of Some Complex Arithmetic

Classwork

Exercises

1. Taking the conjugate of a complex number corresponds to reflecting a complex number about the real axis. What operation on a complex number induces a reflection across the imaginary axis?
2. Given the complex numbers $w=-4+3i$ and
$z=2-5i$, graph each of the following:
	1. $w$
	2. $z$
	3. $w+2$
	4. $z+2$
	5. $w-1$
	6. $z-1$
3. Describe in your own words the geometric effect adding or subtracting a real number has on a complex number.
4. Given the complex numbers $w=-4+3i$ and
$z=2-5i$, graph each of the following:
	1. $w$
	2. $z$
	3. $w+i$
	4. $z+i$
	5. $w-2i$
	6. $z-2i$
5. Describe in your own words the geometric effect adding or subtracting an imaginary number has on a complex number.

**Example 1**

Given the complex number $z$, find a complex number $w$ such that $z+w$ is shifted $\sqrt{2}$ units in a southwest direction.

Lesson Summary

* The conjugate, $\overbar{z}$, of a complex number $z$, reflects the point across the real axis.
* The negative conjugate, $-\overbar{z}$, of a complex number $z$, reflects the point across the imaginary axis.
* Adding or subtracting a real number to a complex number shifts the point left or right on the real (horizontal) axis.
* Adding or subtracting an imaginary number to a complex number shifts the point up or down on the imaginary (vertical) axis.

Problem Set

1. Given the complex numbers $w=2-3i$ and
$z=-3+2i$, graph each of the following:
	1. $w-2$
	2. $z+2$
	3. $w+2i$
	4. $z-3i$
	5. $w+z$
	6. $z-w$
2. Let $z=5-2i$, find $w$ for each case.
	1. $z$ is a $90°$ counterclockwise rotation about the origin of $w$.
	2. $z$ is reflected about the imaginary axis from $w$.
	3. $z$ is reflected about the real axis from $w$.
3. Let $z=-1+2i,w=4-i$, simplify the following expressions.
	1. $z+\overbar{w}$
	2. $\left|w-\overbar{z}\right|$
	3. $2z-3w$
	4. $\frac{z}{w}$
4. Given the complex number $z$, find a complex number $w$ where $z+w$ is shifted
	1. $2\sqrt{2}$ units in a northeast direction.
	2. $5\sqrt{2}$ units in a southeast direction.