Lesson 7: Complex Number Division

Classwork

Opening Exercise

Perform the indicated operations. Write your answer in $a + bi$ form. Identify the real part of your answer and the imaginary part of your answer.

a. $(2 + 3i) + (-7 - 4i)$

b. $i^2(-4i)$

c. $3i - (-2 + 5i)$

d. $(3 - 2i)(-7 + 4i)$

e. $(-4 - 5i)(-4 + 5i)$

Exercises

1. What is the multiplicative inverse of $2i$?

2. Find the multiplicative inverse of $5 + 3i$.

State the conjugate of each number, and then using the general formula for the multiplicative inverse of $z = a + bi$, find the multiplicative inverse.

3. $3 + 4i$

4. $7 - 2i$

5. i

6. 2

7. Show that $a = -1 + \sqrt{3}i$ and $b = 2$ satisfy $\frac{1}{a+b} = \frac{1}{a} + \frac{1}{b}$.

Problem Set

1. State the conjugate of each complex number. Then find the multiplicative inverse of each number, and verify by multiplying by $a + bi$ and solving a system of equations.
   a. $-5i$
   b. $5 - \sqrt{3}i$

2. Find the multiplicative inverse of each number, and verify using the general formula to find multiplicative inverses of numbers of the form $z = a + bi$.
   a. i^3
   b. $\frac{1}{3}$
   c. $\frac{\sqrt{3} - i}{4}$
   d. $1 + 2i$
   e. $4 - 3i$
   f. $2 + 3i$
   g. $-5 - 4i$
   h. $-3 + 2i$
   i. $\sqrt{2} + i$
   j. $3 - \sqrt{2} \cdot i$
   k. $\sqrt{5} + \sqrt{3} \cdot i$

3. Given $z_1 = 1 + i$ and $z_2 = 2 + 3i$.
   a. Let $w = z_1 \cdot z_2$. Find w and the multiplicative inverse of w.
   b. Show that the multiplicative inverse of w is the same as the product of the multiplicative inverses of z_1 and z_2.