Section 1.5 Complex Numbers

Objective: In this lesson you learned how to perform operations with complex numbers.

<table>
<thead>
<tr>
<th>Important Vocabulary</th>
<th>Define each term or concept.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex number</td>
<td></td>
</tr>
<tr>
<td>Imaginary number</td>
<td></td>
</tr>
<tr>
<td>Complex conjugates</td>
<td></td>
</tr>
</tbody>
</table>

I. The Imaginary Unit $i$ (Page 123)

Mathematicians created an expanded system of numbers using the imaginary unit $i$, defined as $i = \sqrt{-1}$, because . . .

By definition, $i^2 = -1$.

For the complex number $a + bi$, if $b = 0$, the number $a + bi = a$ is a(n) _________. If $b \neq 0$, the number $a + bi$ is a(n) _________. If $a = 0$, the number $a + bi = bi$ is a(n) _________.

The set of complex numbers consists of the set of ________ and the set of _________.

Two complex numbers $a + bi$ and $c + di$, written in standard form, are equal to each other if . . .

II. Operations with Complex Numbers (Pages 124–125)

To add two complex numbers, . . .

To subtract two complex numbers, . . .
The **additive identity** in the complex number system is \(0\).
The **additive inverse** of the complex number \(a + bi\) is
______________.

**Example 1:** Perform the operations:
\[(5 - 6i) - (3 - 2i) + 4i\]

To multiply two complex numbers \(a + bi\) and \(c + di\), . . .

**Example 2:** Multiply: \((5 - 6i)(3 - 2i)\)

**III. Complex Conjugates** (Page 126)
The product of a pair of complex conjugates is a(n)
______________ number.

To find the quotient of the complex numbers \(a + bi\) and \(c + di\),
where \(c\) and \(d\) are not both zero, . . .

**Example 3:** Divide \((1 + i)\) by \((2 - i)\). Write the result in
standard form.

**IV. Complex Solutions of Quadratic Equations** (Page 127)
If \(a\) is a positive number, the **principal square root** of the negative
number \(-a\) is defined as ________________.

To avoid problems with multiplying square roots of negative
numbers, be sure to convert to ________________ before
multiplying.
Example 4: Perform the operation and write the result in standard form: \((5 - \sqrt{-4})^2\)

Additional notes

Homework Assignment
Page(s)

Exercises