Sec 5-6

Complex Numbers

Real Numbers

Rational #'s
Any # that can be written as a ratio

- **Intergers**
  ... -2, -1, 0, 1, 2, ...
  - **Whole #'s**
    0, 1, 2, 3, ...
    - **Natural #'s**
      1, 2, 3, 4,...

Irrational #'s
Nonrepeating and Nonterminating decimals

Imaginary Numbers

Numbers involving square roots of negative numbers.

ex: $\sqrt{-7}$

Imaginary Numbers:

$$\sqrt{-1} = i$$

i is called the imaginary unit.

Simplify each.

1. $\sqrt{24}$
   $= \sqrt{4 \cdot 6}$
   $= 2\sqrt{6}$

2. $\sqrt{-24}$
   $= 2i\sqrt{6}$

Simplify each.

1. $\sqrt{-32}$
   $= \sqrt{16 \cdot 2}$
   $= 4i\sqrt{2}$

2. $\sqrt{-196}$
   $= 14i$

3. $\sqrt{-17}$

$= i\sqrt{17}$

4. $7\cdot\sqrt{-24}$

$= 7 i 2\sqrt{6}$ ($\sqrt{4\cdot6}$)

$= 14i\sqrt{6}$

5. $\sqrt{-36} + \sqrt{-81}$

$6i + 9i$

$15i$

6. $2\sqrt{-12} + 5\sqrt{-27}$

$2\sqrt{3}\sqrt{4} + 5\sqrt{9}\sqrt{3}$

$4i\sqrt{3} + 15i\sqrt{3}$

$19i\sqrt{3}$

Complex Numbers:

any number that can be written in the form: a + bi (a and b can be any real #)

Standard Form of a Complex Number

Real Part

Imaginary Part

Real Number: when b=0

Imaginary Number: when b≠0 (a may or may not be zero)

Examples of Imaginary #'s: 10 - 7i or 13i ($0+13i$)

The terms Complex Number and Imaginary Number are quite often used interchangeably.

Write each as a Complex Number in Standard Form

1. $2 + \sqrt{-9}$

$2 + 3i$

2. $\sqrt{-12} - 5$

$\sqrt{4 \cdot 3}$

$-5 + 2i\sqrt{3}$

Simplify each expression:

1. $(6 - \sqrt{-64}) + (5 + \sqrt{-49})$

$(6 - 8i) + (5 + 7i)$

$11 - i$

2. $(-11 + \sqrt{-9}) - (6 - \sqrt{-144})$

$(-11 + 3i) - (6 - 12i)$

$-17 + 15i$

$i = \sqrt{-1}$

$i^2 = -1$

Simplify each:

1. $4i(3 + 6i)$

$12i + 24i^2$

$12i + 24(-1)$

$-24 + 12i$

2. $(2 + 3i)(1 - 5i)$

$2 + 3i$

	2	$+3i$
1		
$-5i$	$-10i$	$-15i^2$

$-15(-1) = 15$

$17 - 7i$