

INTERMEDIATE ALGEBRA

GPS #36

7.6 COMPLEX NUMBERS

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Useful Guidelines:

- * Imaginary Unit: $i = \sqrt{-1}$ and $i^2 = -1$. Example: $\sqrt{-5} = i\sqrt{5}$. i = imaginary number
- * Standard Form: $a + bi$, where a and b are real numbers.
- * Real Part of $a + bi$: a
- * Imaginary Part of $a + bi$: b
- * Complex conjugate of $a + bi$: $a - bi$

1. Use the imaginary unit to write the expression.

a. $\sqrt{-36} = \sqrt{(-1)(36)}$

$= \sqrt{-1} \sqrt{36} = i \cdot 6$

c. $\sqrt{-72} = \sqrt{(-1)(36) \cdot 2} = 6\sqrt{2}i$

2. Write each sum or difference in standard form.

a. $(2+i) + (9-2i)$

$= 11 - i$

c. $(-3+2i) + (4-4i)$

$= -3+2i+4-4i = 1-2i$

3. Write each product in standard form.

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

$= 6 - 2i + 6i - 2i^2$

$= 6 + 4i - 2(-1)$

$= 8 + 4i$ ← imaginary number

c. $(-4+3i)(2+8i)$

$= -12 + 6i - 32i + 24i^2$

$= -12 - 26i + 24(-1)$

$= -36 - 26i$

4. Write each quotient in standard form.

a. $\frac{3(4+3i)}{4-3i(4+3i)}$

$= \frac{12+9i}{16-9i^2}$

$= \frac{12+9i}{16-9(-1)}$

$= \frac{12+9i}{25}$

$= \frac{12}{25} + \frac{9i}{25}$
 ↓ ↑
 Real # Imaginary #

c. $\frac{2-i}{3+4i} \cdot \frac{3-4i}{3-4i}$

$= \frac{6-3i-8i+4i^2}{9-16i^2}$

$= \frac{6-11i+4(-1)}{9+16}$

$= \frac{2-11i}{25}$

$= \frac{2}{25} - \frac{11}{25}i$

b. $\frac{2i(2-5i)}{2+5i(2-5i)}$

$= \frac{4i-10i^2}{4-25i^2}$

$= \frac{4i-10(-1)}{4+25}$

$= \frac{4i+10}{29}$

d. $\frac{(1+2i)^2(-5i)}{5i(2-5i)}$

$= \frac{-5i-10i^2}{-25i^2}$

$= \frac{-5i-10(-1)}{-25(-1)}$

$= \frac{10}{29} + \frac{4}{29}i$

$= \frac{-5i+10}{25}$

$= \frac{10}{25} - \frac{5i}{25}$

$= \frac{2}{5} - \frac{1}{5}i$