Chapter 3: Complex Numbers

Complex Numbers and Roots:

Simplify the following.

\[ \sqrt{-3}, \quad 4\sqrt{-162}, \quad \frac{\sqrt{-20}}{5}, \quad \frac{3}{4}\sqrt{-12}, \quad \frac{5}{\sqrt{12}} \]

Solve the following.

\[ 3x^2 = -48, \quad x^2 - 20x = -125, \quad x^2 = -81 \]
\[ 6x^2 + 150 = 0, \quad x^2 - 8x + 30 = 0, \quad x^2 - 14x = -75 \]

Find the values of x and y that make the equation true.

\[ -9x + 8i = -54 + (16y)i, \quad 5x + 6i = -35 - (24y)i, \quad 9x + (y)i - 5 = -12i + 4 \]
\[ 2x - 20i = 8 - (4y)i, \quad 5i - 6x = (10y)i + 2, \quad 3x - 12i = 6 + (4y)i \]

Find each complex conjugate.

\[ 5 - 4i, \quad -4i + 5, \quad -16 + i, \quad 14i, \quad i\sqrt{3} + \]
\[ 7\sqrt{3} \]

Operations with Complex Numbers:

Find each absolute value.

\[ |6 + 2i|, \quad |3 + i|, \quad |3 - 4i|, \quad |-i - 4|, \quad |-7 + 5i| \]

Sketch a graph of the complex plane. Label your axes. Then, plot the following points.

A. 2i B. -4i C. 3 + i D. 4 - 4i E. -2 + 3i F. -3 - 2i

Find the sum of the following complex numbers by graphing.

\[ (1 + 2i) + (-3 + 4i), \quad (2 + 7i) + (5 - 3i), \quad (-1 + 2i) + (-2 - 5i) \]

Perform the indicated operation, and write the result in the form \( a + bi \).

\[ (3 - 3i) - (4 + 7i), \quad (-1 + 6i)(3 - 2i), \quad 3i(2 - 3i) \]
\[ 2i^{15}, \quad (-2 - 2i) + (8 - 6i), \quad i^{24} \]
\[ (2 - 11i) - (10 + 6i), \quad (-6 + 4i) + (7 - 2i), \quad \frac{5+i}{2-i} \]
\[ 4i^{18}, \quad (-1 + 2i) - (6 - 9i), \quad -3i^{37} \]
\[ 2 + 4i \]
\[ -12 + 26i \]
\[ 2 + 4i \]