

TOPIC 1.5: COMPLEX NUMBERS

PERFORMANCE OBJECTIVES

Students will be able to:

- add, subtract, multiply and divide complex numbers
- express all answers in the $a + bi$ form
- simplify expressions involving powers of i

STRATEGIES

- Begin the lesson by having the students do the following: Verify that $3 - 2i$ is a solution of the quadratic equation $x^2 - 6x + 13 = 0$ by replacing it for x and simplifying.
- In the discussion of the Do Now, we review how to add, subtract and multiply complex numbers.
- Summarize these rules on the board for the class:
 - (1) If $a > 0$, $\sqrt{-a} = i\sqrt{a}$.
 - (2) $\sqrt{-1} = i$ and $i^2 = -1$.
 - (3) To add or subtract complex numbers in the form $a + bi$, combine the real parts first as in combining like terms, and then combine the imaginary parts.
 - (4) Use the distributive law and/or FOIL to multiply complex numbers.
- Ask the students to simplify $i^3 (2i + 8)$ in $a + bi$ form. Based on the solution of the problem elicit from the students the rule for evaluating i^4 , i^8 , and i^{12} . Summarize the rule for raising i to a power that is a multiple of 4. Use symbolic notation to do this, i.e., $i^{4n} = 1$. Generalize the rule to simplify i^{75} . Additional practice examples may be used if needed.
- Elicit that the rule for division has not yet been discussed and then pose the following problem: Divide: $\frac{5-2i}{4+3i}$. Lead the class through the rationalizing process by the complex conjugate $4 - 3i$ to get as an answer $\frac{14-23i}{25}$ or $\frac{14}{25} - \frac{23i}{25}$ in $a + bi$ form. Summarize the rule for division as rationalizing the quotient by the divisor's complex conjugate and expressing the result in $a + bi$ form.
- Verify that the quotient of the previous problem is correct by multiplying $\frac{14}{25} - \frac{23i}{25}$ by the original divisor of $4 + 3i$ to get the original dividend $5 - 2i$.
- If the teacher feels that it is necessary to include more examples of addition, subtraction, multiplication or division, use examples from the textbook.

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