2.5 Complex Numbers & the Fundamental Theorem of Algebra

Target 2C: Construct Polynomials given Real and/or Imaginary Zeroes
Target 2D: Understand the Fundamental Theorem of Algebra

Review of Prior Concepts

Solve each quadratic equation:

a) $x^2 = -4$

b) $x^2 + 5 = 4x$

More Practice

Complex Solutions
http://www.regentsprep.org/regents/math/algtrig/ate3/quadcomlesson.htm
http://www.coolmath.com/algebra/10-complex-numbers/03-quadratic-formula-01
https://www.mathsisfun.com/numbers/complex-numbers.html

SAT Connection
Passport to Advanced Math
4. Create an equivalent form of an algebraic expression

Example: Which of the following complex numbers is equivalent to $\frac{3-5i}{8+2i}$? (Note: $i = \sqrt{-1}$)

A) $\frac{3}{8} - \frac{5i}{2}$

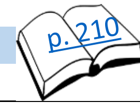
B) $\frac{3}{8} + \frac{5i}{2}$

C) $\frac{7}{34} - \frac{23i}{34}$

D) $\frac{7}{34} + \frac{23i}{34}$

Solution

Fundamental Theorem of Algebra



Vocabulary Term	In my own words…	Example(s)
Fundamental Theorem of Algebra		

Examples:

Using your graphing calculator, find the complex zeroes and write the polynomial in factored form:

1) $f(x) = 4x + 3$

2) $g(x) = x^2 - 4$

3) $h(x) = 2x^3 + 3x^2 - 11x - 6$

4) $f(x) = x^3 - 2x^2 + x - 2$

Complex Conjugate Zeros

If $a + bi$ is a zero of $f(x)$, then ______________________________________

****Imaginary Zeroes are always _______________________________*****

Examples:

Write a polynomial in standard form with the following zeroes:

5) 4, $2i$

6) 3 (multiplicity 2), $1 - i$ (multiplicity 1)

7) Given $f(x) = x^4 - 2x^3 + 5x^2 + 10x - 50$ has a zero of $1 + 3i$. Find all of the zeroes and write a linear factorization of $f(x)$.

More Practice

Fundamental Theorem of Algebra
https://www.khanacademy.org/math/algebra2/polynomial-functions/fundamental-theorem-of-algebra/v/fundamental-theorem-of-algebra-intro
https://www.mathsisfun.com/algebra/fundamental-theorem-algebra.html
https://www.youtube.com/watch?v=NZS3T43NBvE
https://www.youtube.com/watch?v=PQr0yVq5ysc
https://www.youtube.com/watch?v=gyksK76Dg1c

Homework Assignment

p.215 #3,5,9,11,15,17,20,27,31

SAT Connection

Solution

Choice C is correct. To perform the division $\frac{3-5i}{8+2i}$, multiply the numerator and denominator of $\frac{3-5i}{8+2i}$ by the conjugate of the denominator, $8-2i$. This gives $\frac{(3-5i)(8-2i)}{(8+2i)(8-2i)} = \frac{24-6i-40i+(-5i)(-2i)}{8^2-(2i)^2}$. Since $i^2=-1$, this can be simplified to $\frac{24-6i-40i-10}{64+4} = \frac{14-46i}{68}$, which then simplifies to $\frac{7}{34} - \frac{23i}{34}$.

Choices A and B are incorrect and may result from misconceptions about fractions. For example, $\frac{a+b}{c+d}$ is equal to $\frac{a}{c+d} + \frac{b}{c+d}$, not $\frac{a}{c} + \frac{b}{d}$. Choice D is incorrect and may result from a calculation error.