Lesson 39: Factoring Extended to the Complex Realm

Classwork

Opening Exercise

Rewrite each expression as a polynomial in standard form.

Exercises 1–4

Completely factor the following polynomial expressions.

1. Consider the polynomial .
   1. What are the solutions to ?
   2. How many -intercepts does the graph of the equation have? What are the coordinates of the -intercepts?
   3. Are solutions to the polynomial equation the same as the -intercepts of the graph of ? Justify your reasoning.
2. Write a polynomial with the lowest possible degree that has the given solutions. Explain how you generated each answer.
   1. ,,,
   2. ,
   3. ,,,
   4. , , ,
   5. , , ,

Lesson Summary

* Polynomial equations with real coefficients can have real or complex solutions or they can have both.
* Complex solutions to polynomial equations with real coefficients are always members of a conjugate pair.
* Real solutions to polynomial equations are the same as -intercepts of the associated graph, but complex solutions are not

Problem Set

1. Rewrite each expression in standard form.
2. Suppose in Problem 1 that you had no access to paper, writing utensils, or technology. How do you know that the expressions in parts (a)–(d) are polynomials with real coefficients?
3. Write a polynomial equation of degree 4 in standard form that has the solutions , , , .
4. Explain the difference between -intercepts and solutions to an equation. Give an example of a polynomial with real coefficients that has twice as many solutions as -intercepts. Write it in standard form.
5. Find the solutions to and the -intercepts of the graph of .
6. Find the solutions to and the -intercepts of the graph of .
7. Find the solutions to and the -intercepts of the graph of .
8. Use the fact that to explain how you know that the graph of has no -intercepts. You need not find the solutions.