Course Number
Instructor
Date

Section 2.5 Zeros of Polynomial Functions

Objective: In this lesson you learned how to determine the number of rational and real zeros of polynomial functions, and find the zeros.

Important Vocabulary Define each term or concept.

Conjugates

Irreducible over the reals

Variation in sign

Upper bound

Lower bound

I. The Fundamental Theorem of Algebra (Page 169)

> ***What you should learn***
> How to use the Fundamental Theorem of Algebra to determine the number of zeros of polynomial functions

The **Fundamental Theorem of Algebra** guarantees that, in the complex number system, every *n*th-degree polynomial function has ________________ zeros.

Example 1: How many zeros does the polynomial function $f(x) = 5 - 2x^2 + x^3 - 12x^5$ have?

The **Linear Factorization Theorem** states that . . .

II. The Rational Zero Test (Pages 170–172)

> ***What you should learn***
> How to find rational zeros of polynomial functions

Describe the purpose of the Rational Zero Test.

State the **Rational Zero Test.**

To use the Rational Zero Test, . . .

Example 2: List the possible rational zeros of the polynomial function $f(x) = 3x^5 + x^4 + 4x^3 - 2x^2 + 8x - 5$.

Some strategies that can be used to shorten the search for actual zeros among a list of possible rational zeros include . . .

III. Conjugate Pairs (Page 173)

What you should learn
How to find conjugate pairs of complex zeros

Let $f(x)$ be a polynomial function that has *real coefficients.* If $a + bi$ (where $b \neq 0$) is a zero of the function, then we know that ________________ is also a zero of the function.

Example 3: Give the complex conjugate of $3 - 7i$.

IV. Factoring a Polynomial (Pages 173–175)

> ***What you should learn***
> How to find zeros of polynomials by factoring

To write a polynomial of degree $n > 0$ with real coefficients as a product without complex factors, write the polynomial as . . .

Example 4: Write the polynomial function $f(x) = x^4 + 5x^2 - 36$ as the product of linear factors, and list all of its zeros.

Explain why a graph cannot be used to locate complex zeros.

V. Other Tests for Zeros of Polynomials (Pages 176–178)

> ***What you should learn***
> How to use Descartes's Rule of Signs and the Upper and Lower Bound Rules to find zeros of polynomials

Descartes's Rule of Signs sheds more light on the number of ________________a polynomial function can have.

State **Descartes's Rule of Signs.**

When using Descartes's Rule of Signs, a zero of multiplicity k should be counted as ___________ zeros.

Example 5: Find the number of variations in sign in $f(x) = 2x^6 + 3x^5 - x^4 - 9x^3 + x^2 + 5x - 7$, as well as the number of variations of sign in $f(-x)$. Then discuss the possible numbers of positive real zeros and the possible number of negative real zeros of this function.

State the Upper and Lower Bound Rules.

Explain how the Upper and Lower Bound Rules can be useful in the search for the real zeros of a polynomial function.

Homework Assignment

Page(s)

Exercises