

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.

Course Number

Instructor

Date

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)

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

$$f(x) = 5 - 2x^2 + x^3 - 12x^5 \text{ have?}$$

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

What you should learn

How to use the Fundamental Theorem of Algebra to determine the number of zeros of polynomial functions

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

Describe the purpose of the Rational Zero Test.

What you should learn

How to find rational zeros of polynomial functions

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)

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.

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

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

IV. Factoring a Polynomial (Pages 173–175)

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

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

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)

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

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

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

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