GUIDED NOTES – 5.5 ZEROS OF POLYNOMIALS

LEARNING OBJECTIVES

In this section, you will:

- Evaluate a polynomial using the Remainder Theorem
- Use the Factor Theorem to solve a polynomial equation.
- Use the Rational Zero Theorem to find rational zeros.
- Find zeros of a polynomial function.
- Use the Factor Linearization Theorem to find polynomials with given zeros.
- Use Descartes' Rule of Signs.
- Solve real-world applications of polynomial equations.

EVALUATING A POLYNOMIAL USING THE REMAINDER THEOREM

Study the box in your textbook section titled "the Remainder Theorem."

- If a polynomial $f(x)$ is divided by _____, then the remainder is the value _____.

- Write out the 2 step process for evaluating $f(x)$ at $x = k$ using the Remainder Theorem, given a polynomial function f.

  1.

  2.

Try It: Read Example 1 in the text, then answer the following.

Use the Remainder Theorem to evaluate $f(x) = 2x^5 - 3x^4 - 9x^3 + 8x^2 + 2$ at $x = -3$.

USING THE FACTOR THEOREM TO SOLVE A POLYNOMIAL EQUATION

Study the box in your textbook section titled "the Factor Theorem."

- According to the Factor Theorem, k is a _____ of $f(x)$ if and only if _____ is a factor of $f(x)$.

- Write out the 5 step process for using the Factor Theorem to factor the polynomial, given a factor and a third degree polynomial.

1.

2.

3.

4.

5.

Try It: Read Example 2 in the text, then answer the following.

Use the Factor Theorem to find the zeros of $f(x) = x^3 + 4x^2 - 4x - 16$ given that $(x - 2)$ is a factor of the polynomial.

USING THE RATIONAL ZERO THEOREM TO FIND RATIONAL ZEROS

Study the box in your textbook section titled "the Rational Zero Theorem."

- The Rational Zero Theorem states that if a polynomial has integer coefficients, then every rational zero of $f(x)$ has the form _____, where _____ is a factor of the constant term and _____ is a factor of the leading coefficient.

- Write out the 3 step process for using the Rational Zero Theorem to find rational zeros, given a polynomial function $f(x)$.

  1.

  2.

  3.

Try It: Read Example 3 in the text, then answer the following.

Use the Rational Zero Theorem to find the rational zeros of $f(x) = x^3 - 13x + 12$.

FINDING THE ZEROS OF POLYNOMIAL FUNCTIONS

- Write out the 4 step process for using synthetic division to find its zeros, given a polynomial function f.

    1.

    2.

    3.

    4.

USING THE FUNDAMENTAL THEOREM OF ALGEBRA

Study the box in your textbook section titled "the Fundamental Theorem of Algebra."

- The Fundamental Theorem of Algebra states that, if $f(x)$ is a polynomial degree $n >$ _____, then $f(x)$ has at least one _____ zero.

Try It: Read Example 6 in the text, then answer the following.

Find the zeros of $f(x) = 2x^3 + 5x^2 - 11x + 4$.

USING THE LINEAR FACTORIZATION THEOREM TO FIND POLYNOMIALS WITH GIVEN ZERO

Study the box in your textbook section titled "complex conjugate theorem."

- According to the Linear Factorization Theorem, how many factors will a polynomial function have?

- If the polynomial function f has real coefficients and a complex zero in the form $a + bi$, the

  _____ of the zero, _____, is also a zero.

- Write out the 4 step process for using the Linear Factorization Theorem to find the polynomial function, given the zeros of a polynomial function f and a point $(c, f(c))$.

  1.

  2.

  3.

  4.

Try It: Read Example 7 in the text, then answer the following.

Find a third degree polynomial with real coefficients that has zeros of 5 and $-2i$ such that $f(1) = 10$.