



Algebra II

Unit 3: Polynomials Functions

References

Textbook:

- HMH Advanced Algebra, Unit 2 Module 4

Online Access:

<http://www.my.hrw.com>

Helpful Links:

- GA Virtual Learning
<http://cms.gavirtualschool.org/Shared/Math/GSEAdvancedAlgebra/PolynomialFunctions/index.html>
- Fundamental Theorem of Algebra
<https://mathbitsnotebook.com/Algebra2/Quadratics/QDFundamentalThm.html>
- The Polynomial Remainder Theorem
<https://mathbitsnotebook.com/Algebra2/Polynomials/PORemainderTh.html>
- Polynomial Identities
<https://mathbitsnotebook.com/Algebra2/Polynomials/POIdentity.html>
- Graph Polynomial Functions
<https://mathbitsnotebook.com/Algebra2/Polynomials/POGraphing.html>
- MathBitsNotebook Algebra 2
<http://mathbitsnotebook.com/Algebra2/Algebra2.html>

Dear Parents,

In this unit, students continue their study of polynomials by identifying zeros and making connections between zeros of a polynomial and solutions of a polynomial equation. Students will see how the Fundamental Theorem of Algebra can be used to determine the number of solutions of a polynomial equation and will find all the roots of those equations. Students will graph polynomial functions and interpret the key characteristics of the function

Concepts Students will Use & Understand

- use polynomial identities to solve problems
- use complex numbers in polynomial identities and equations
- understand and apply the rational Root Theorem
- understand and apply the Remainder Theorem
- understand and apply The Fundamental Theorem of Algebra
- understand the relationship between zeros and factors of polynomials
- represent, analyze, and solve polynomial functions algebraically and graphically

Vocabulary

End Behavior: the value of $f(x)$ as x approaches positive and negative infinity

Relative Minimum: a point on the graph where the function is increasing as you move away from the point in the positive and negative direction along the horizontal axis.

Relative Maximum: a point on the graph where the function is decreasing as you move away from the point in the positive and negative direction along the horizontal axis.

Fundamental Theorem of Algebra: every non-zero single-variable polynomial with complex coefficients has exactly as many complex roots as its degree, if each root is counted up to its multiplicity.

Multiplicity: the number of times a root occurs at a given point of a polynomial equation.

Pascal's Triangle: an arrangement of the values of ${}_n C_r$ in a triangular pattern where each row corresponds to a value of n

Rational Root Theorem: a theorem that provides a complete list of all possible rational roots of a polynomial equation. It states that every rational zero of the polynomial equation $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$, where all coefficients are integers, has the

following form: $\frac{p}{q} = \frac{\text{factors of constant term } a_0}{\text{factors of leading coefficient } a_n}$

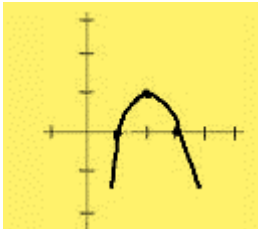
Remainder Theorem: states that the remainder of a polynomial $f(x)$ divided by a linear divisor $(x - c)$ is equal to $f(c)$

Sample Problems

1. The height of an arrow shot by a 6 foot tall person is given by the function equation image indicator where h is the height and t is the time. At what time would the arrow be able to hit a target 10 feet in the air?

The arrow could hit a 10 foot target in 2 sec. or in $2\frac{2}{3}$ sec.

2. Draw a rough sketch of the graph of $y = -x^2 + 4x - 3$

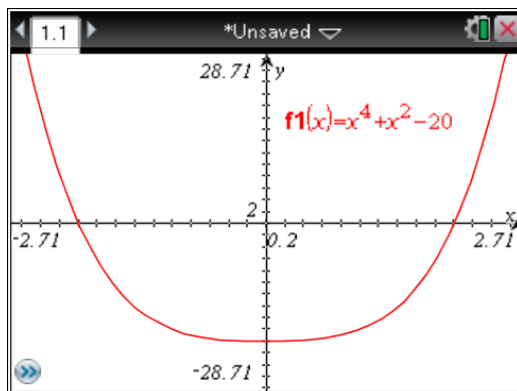


3. A soccer ball is kicked from the ground. The height of the ball is modeled by the equation $h(t) = -4.9t^2 + 19.6t$ Height is in meters. Time is in seconds. How long is the ball in the air?

4 seconds

4. Describe the key features of the following polynomial function:

$$f(x) = x^4 + x^2 - 20$$



Rational roots:

$$x = -2, 2$$

Irrational roots:

None

Non-real roots:

$$x = -\sqrt{5}i, \sqrt{5}i$$

Relative maximum points:

None

Relative minimum points:

$$(0, -20)$$

End behavior:

$$x \rightarrow -\infty, f(x) \rightarrow \infty; x \rightarrow \infty, f(x) \rightarrow \infty$$