



Pre-College Algebra & Trigonometry - Unit 4 - Polynomials

Unit Focus

Students will be extremely proficient and confident at factoring in order to be able to solve polynomials later in this unit and to facilitate ease with Unit 5: simplifying rational expressions and solving rational equations. Complex numbers are briefly touched on, as is the quadratic formula, but only as tools for solving higher degree polynomial equations. Students should know by the end of this unit that the number of solutions to a polynomial equation is the same as the degree of the polynomial (The Fundamental Theorem of Algebra). Students will graph polynomials with attention to intercepts and end behavior. Quadratics are considered an optional topic.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real. (CCSS.MATH.CONTENT.HSN.CN.A.1) - Solve quadratic equations with real coefficients that have complex solutions. (CCSS.MATH.CONTENT.HSN.CN.C.7) - Extend polynomial identities to the complex numbers. For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$. (CCSS.MATH.CONTENT.HSN.CN.C.8) - Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. (CCSS.MATH.CONTENT.HSN.CN.C.9) - Interpret parts of an expression, such as terms, factors, and coefficients. (CCSS.MATH.CONTENT.HSA.SSE.A.1.A) - Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P. (CCSS.MATH.CONTENT.HSA.SSE.A.1.B) - Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. (CCSS.MATH.CONTENT.HSA.SSE.A.2) - Factor a quadratic expression to reveal the zeros of the function it defines. (CCSS.MATH.CONTENT.HSA.SSE.B.3.A) - Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. (CCSS.MATH.CONTENT.HSA.APR.B.3)	<i>Students will be able to independently use their learning to...</i> T1 manipulate equations/expressions or objects to create order and establish relationships. T2 draw conclusions about graphs, shapes, equations, or objects. T3 make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians examine relationships to discern a pattern, generalizations, or structure. U2 Mathematicians examine the impact of operations and how they relate to one another. U3 Mathematicians can describe patterns, relations, and/or functions to access strategies to solve problems. U4 Mathematicians represent and analyze mathematical situations and structures using algebraic symbols to communicate thinking.	<i>Students will keep considering...</i> Q1 How can I simplify the problem? Q2 How do predictable patterns help us? Q3 Have I used what I understand about numbers to make this easier? Q4 How do I decide if my answer makes sense and if not, what do I do?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 when a polynomial is completely factored the product of the first term of all those factors is the first term of the polynomial	<i>Students will be skilled at...</i> S1 factoring polynomials (trinomials, difference of squares, difference of cubes) S2 division of polynomials

Stage 1: Desired Results - Key Understandings

- Graph linear and quadratic functions and show intercepts, maxima, and minima. (CCSS.MATH.CONTENT.HSF.IF.C.7.A)
- Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)
- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Look for and make use of structure. (CCSS.MATH.MP.7)
- Look for and express regularity in repeated reasoning. (CCSS.MATH.MP.8)

Madison Public Schools Profile of a Graduate

- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

K2 when a polynomial is completely factored the product of the second term of all those factors is the last term of the polynomial

K3 the degree of the polynomial tells you how many solutions the equation has (Fundamental Theorem of Algebra)

K4 the factors of the polynomial correspond to the x intercept of the graph

K5 Vocabulary: factor, term, trinomial, Greatest Common Factor, Long Division, Synthetic Division, Complex Number, Imaginary, End Behavior

S3 solving polynomial equations up to degree 4

S4 solving equations by factoring

S5 working with complex numbers

S6 graphing polynomials of degree 2 and higher

S7 estimating the value of a function at the ends of the graph

S8 creating an equation from a given equation