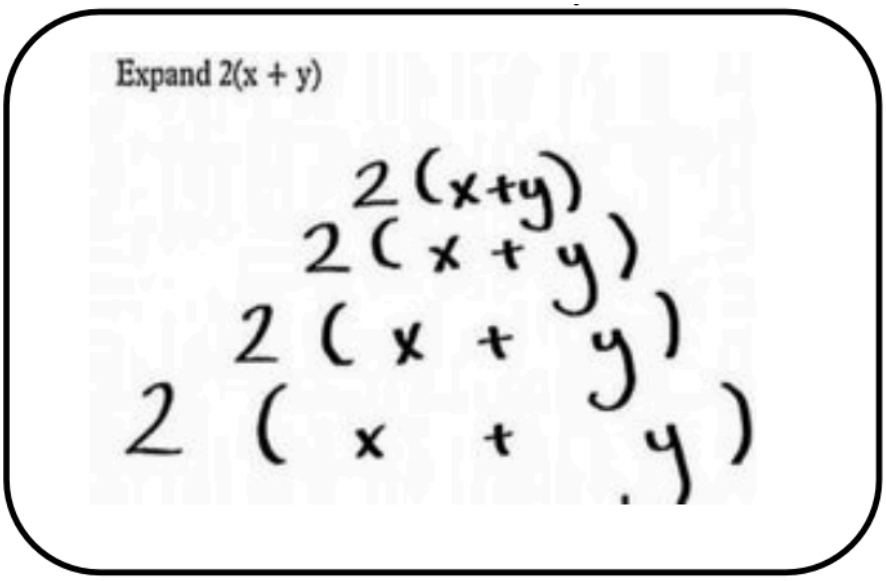
Polynomials



Description

In Unit 3, Polynomials, students will apply skills from the first two units to develop an understanding of the features of polynomial functions. Analysis of polynomial functions for degree, end behavior, number, and type of solutions builds on the work done in Unit 2; advanced topics that will be applied to future function types. Students will write polynomial functions to reveal features of the functions, find solutions to systems, and apply transformations, building from Units 1 and 2. Division of polynomials is introduced in this unit and will be explored through the concepts of the remainder theorem as well as a prerequisite to rational functions.

Unit Priority Standards

- HSF.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, negative, relative maximums and minimums, symmetries, end behavior, and periodicity.
- HSF.IF.C.7 Graph functions expressed symbolically and show key features of the graph (of a function), by hand in simple cases and using technology for more complicated cases.
- HSF.IF.C.7.C Graph polynomial functions, identify zeros when suitable factorizations are available, and showing end behavior.
- HSF.BF.A.1 Write a function that describes a relationship between two quantities.
- HSF.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x)+k, k(fx), f(kx), and f(x+k) for specific values of k (both positive and negative), find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- HSA.APR.B.2 Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x-a is a p(a), so p(a) = 0 if and only if (x-a) is a factor of p(x).
- HSA.APR.B.3 Identify zeros of polynomials when suitable factorizations are available, and use zeros to construct a rough graph of the function defined by the polynomial.
- HSA.APR.C.4 Prove polynomial identities and use them to describe numerical relationships.
- HSA.APR.D.6 Rewrite simple rational expressions in different forms, write a(x) b(x) in the form of q(x) + r(x)b(x), where a(x), b(x), q(x), and r(x) are polynomials with the

degree of r(x) less than the degree of b(x), using inspection, long division, or for the more complicated examples, a computer algebra system. *Remainder Theorem.

Unit Transfer Goals

- Apply mathematics to problems that arise in everyday life, society, and the workplace.
- Use a problem-solving model that incorporates analyzing the information given, determining a plan or strategy, solving the problem, justifying the solution, and checking for reasonableness of the answer.
- Communicate and organize mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate in a professional manner.

Unit Essential questions	
1. What are the characteristics of the polynomial functions? 2. How do you use the fundamental theorem of algebra to determine the number of zeros of a polynomial function?	
Acquisition of Knowledge Skill	
Students will know… 1. The Fundamental Theorem of Algebra 2. The rational Root Theorem 3. Conjugate Root Theorem 4. How to categorize a polynomial in standard form by degree and type 5. The procedure to evaluate polynomials using direct and synthetic substitution 6. Special product patterns and special factoring patterns 7. Remainder theorems	*Students will be skilled at…*I can... 1. Evaluate a polynomial function 2. Graph a polynomial function 3. Add, subtract, and multiply polynomials 4. Factor polynomial expressions 5. Use factoring to solve polynomial equations 6. Divide polynomials and relate the result to the factor theorem 7. Find the rational zeros of a polynomial function 8. Use the fundamental theorem of

	algebra to determine the number of zeros of a polynomial function

Unit Plan

Week 1: 8 - 12 November	**Polynomial Functions** What are the characteristics of the polynomial functions?
Learning Target(s):	● Day 1: Polynomial Functions ● Day 2: Polynomials, Linear Factors, and Zero ● Day 3: Solving Polynomial Equations
Acquired Knowledge & Skills:	● Classify polynomials ● Graph polynomial functions and describe end behavior ● Analyze the factored form of a polynomial ● Write a polynomial function from its zeros ● Solve polynomial equations by factoring/graphing
Activities:	● Guided Notes ○ Follow along on Jamboard ● Practice on Desmos ● Practice in workbook ● Check In (on Day 3)
Due Dates and Assessments:	● HW: Worksheet

Week 2: 15 - 19 November	**The Fundamental Theorem of Algebra** How do you use the fundamental theorem of algebra to determine the number of zeros of a polynomial function?
Learning Target(s):	● Day 1: Dividing Polynomials (Long Division) ● Day 2: Dividing Polynomials (Synthetic) ● Day 3: Theorems about Roots of Polynomials ● Day 3: The Fundamental Theorems of Algebra
Acquired Knowledge & Skills:	● Divide polynomials using long/synthetic division ● Solve equations using the rational root theorem ● Use conjugate root theorem ● Use the fundamental theorem of algebra to solve polynomial equations with complex solutions.
Activities:	● Guided Notes ○ Follow along on Jamboard ● Practice in workbook ● Exit Tickets ● Check-In (on Day 3)
Due Dates and Assessments:	● HW: Worksheets/Workbook ● Optional: Quadratic Functions (link under Additional Resources)

Week 2: 22 - 25 November	**The Fundamental Theorem of Algebra** How do you use the fundamental theorem of algebra to determine the number of zeros of a polynomial function?
Learning Target(s):	● Day 1: Theorems about Roots of Polynomials ● Day 2: The Fundamental Theorems of Algebra
Acquired Knowledge & Skills:	● Solve equations using the rational root theorem ● Use conjugate root theorem ● Use the fundamental theorem of algebra to solve polynomial equations with complex solutions.
Activities:	● Guided Notes ○ Follow along on Jamboard ● Practice in workbook ● Exit Tickets
Due Dates and Assessments:	● HW: Worksheets/Workbook ● Optional: Quadratic Functions (link under Additional Resources)

Week 3: 29 November - 3 December	**Polynomial Models in Real World** What are the characteristics of the polynomial functions? How do you use the fundamental theorem of algebra to determine the number of zeros of a polynomial function?
Learning Target(s):	● Day 1: Polynomial Models in the Real World ● Day 2: Transforming Polynomial Functions ● Day 3: Unit 3 Review
Acquired Knowledge & Skills:	● Fit data to linear, quadratic, cubic, or quartic models. ● Apply transformations to graphs of polynomials ● Review skills from Unit 3
Activities:	● Guided Notes ○ Follow along on Jamboard ● Practice in workbook ● Exit Tickets
Due Dates and Assessments:	● HW: Worksheets/Workbook ● Check-In ● Optional: Quadratic Functions (link under Additional Resources)

Week 4: 6 - 10 December	**Unit Review & Test** What are the characteristics of the polynomial functions? How do you use the fundamental theorem of algebra to determine the number of zeros of a polynomial function?
Learning Target(s):	● Day 1: Unit Test
Acquired Knowledge & Skills:	● Polynomial functions ● Intro to the next unit
Activities:	● Unit 3 Test
Due Dates and Assessments:	● Unit 3 Review Due before the test ● Portfolio due before the test ● Quadratic Functions Project due before the test

Assessment Details

Evidence	
I will check students' understanding throughout the unit by...	
Summative ● Portfolio ○ Challenging questions from the unit to provide evidence of the student's understanding ● Check-In ○ Check the student's understanding throughout the unit. ● Unit Test ○ Unit assessment to test student's knowledge in linear functions.	**Formative** ● Warm Ups ○ 2 or 3 problems (either preview of the lesson or concept from the previous lesson) on the board or posted on Google Classroom. ● Exit Tickets ○ Provide feedback to the students after the lesson. ● Class participation & Discussion ● Circulating classroom to monitor student's work

Additional Resources

Here are additional resources to help you in this unit.	
Khan Academy	Please work on the topics you may need help with. If you need help on where to start, please send me an email.
Delta Math	Great practice website. Please let me know (via email) if you'd like me to assign specific topics here.

Math is Fun	Great tool for Algebra 2 concepts explained in easy language. Look under ‘Polynomials.’