Differentiated Instruction Lesson / Unit Plan Template

Subject or Course: CP Precalculus 232 Grade Level(s): 11

Lesson / Unit Topic:

Unit 2: Polynomial Functions

Related Common Core Learning Standard(s):

N-CN - A. Perform arithmetic operations with complex numbers.
1. 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
C. Use complex numbers in polynomial identities and equations. 7. Solve quadratic equations with real coefficients that have complex solutions
A-SSE A. Interpret the structure of exponential, polynomial, and rational expressions.
1. Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity.
A-APR A. Perform arithmetic operations on polynomials.
1. Understand that polynomials form a system analogous to the integers, namely, they are closed under certain operations.
a. Perform operations on polynomial expressions (addition, subtraction, multiplication, and division), and compare the system of polynomials to the system of integers when performing operations.
B. Understand the relationship between zeros and factors of polynomials.
2. Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).
3. 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.
D. Rewrite rational expressions. 6. Rewrite simple rational expressions in different forms; write a(x) /b(x) in the form 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
F-IF B. Interpret functions that arise in applications in terms of the context (polynomial, ~~rational, square root and cube root, trigonometric, and logarithmic functions~~).
4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the 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, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
C. Analyze functions using different representations.
7. Graph functions expressed symbolically and show key features of the graph; by hand in simple cases and using technology for more complicated cases.
C. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
a. Use the process of factoring in a polynomial function to show zeros, extreme values, and symmetry of the graph and interpret these in terms of a context.

Differentiation of Lesson Content: Every student is an individual, having strengths and areas for growth, therefore learning target areas change for each students' subject depending on their learning style

Essential Learning Targets (What ALL students will learn):

- Graphing polynomial functions
- Factoring & Solving polynomials
- Solving polynomials via the Rational Roots Theorem & Synthetic Division to find zeros
- Analyzing graphs of polynomials
- Generating polynomials from graphs or given information

Differentiation of Assessment

Essential Assessment Targets (What ALL students will demonstrate):

All students will demonstrate how to
- Factor polynomial functions
- Combine factoring, synthetic division, and the rational roots theorem to find zeros
- Graph polynomial functions
- Analyze graphs of polynomials
- Create polynomial functions from graphs

Student feedback and how progress will be recorded: How will you provide feedback for your students? How will you record progress or needs? How will you use this information?

- Students will be informally and formatively assessed by the teachers as they circulate the room. Teachers will be looking at students' work and listening to conversations.
- Each activator is designed to assess pre-requisite skills for the lesson.
- Most homework will be assigned on deltamath.com. Students will be required to get a preset number of problems correct to earn full credit. On each problem students complete they receive immediate feedback from the program and can try as many as needed to earn the minimum required number correct. Delta Math also has help videos.
    - Teachers can use the data from deltamath.com to determine how many problems students had to try to meet the minimum correct, how long each problem was open, and if any of the built in help videos were watched.
- 2.1 Summative graded assignment (sample). Students work in assigned groups of 3 to complete this assignment, grading was done via the DHS *Acquire, Integrate, and Apply Knowledge* and *Collaborate* Rubrics. While this assignment is graded and is summative of what students have learned in this lesson, it is also used as a formative assessment to determine where students might continue to struggle as we progress through the unit.
- Lesson 2.2: Students work in groups to graph polynomials on classroom white board while teachers monitor their progress
- 2.2 Quiz
- 2.3 - 2.5 Quiz
- Roller Coaster Project
- Unit Test

Elements of Differentiated Instruction

Process

Elements of Universal Design

Multiple Means of Representation

See individual lessons

Multiple Means of Engagement

See individual lessons

Product	**Elements of Universal Design**
	Multiple Means of Expression
	See individual lessons

Materials
• Chromebooks (desmos.com, wolframalpha.com, deltamath.com) • TI Graphing calculators • Scaffolded notes templates • Graph paper • Colored pencils • White board markers & erasers • Small white boards

Technology (Computer and/or Assistive) to Support Learning
TI Graphing calculators Desmos graphing technology

Lesson/Unit Procedures	Individual Accommodations Needed for Participation
Lesson 2.1: Quadratic Functions Review Lesson 2.2: Factored Form Polynomials Lesson 2.3: Standard Form & Factoring Polynomials Lesson 2.4: Synthetic Division & Remainder/Factor Theorems Lesson 2.5: Rational Roots Theorem Lesson 2.6: Analyzing Polynomial Graphs & Generating Polynomials	• Universal Accommodation: Graphic Organizers or scaffolded notes. • All notes posted to Schoology for students who struggle to take notes during class. • Quality over Quantity for HW: The delta math assignments should not take take more than 30-40 minutes. Students (especially those who perseverate on problems) are empowered to stop working after 40 minutes and communicate with the teacher. • Separate setting & extended time accommodations for students who need it. • During the end of unit project we also made separate setting available during work days in co taught classes. • Teacher(s) circulate the room to check in with students strategically (certain students first, students with immediate questions next, then students who need some processing time, and finally any students we haven't checked in with yet. • Planned & spontaneous differentiation in

	cotaught classes: My co teacher and I typically planned groupings for group work activities and planned on one of us spending most of our time with certain groups. As each day begins with an activator we often would do this “only the fly” more than we expected. ● How we use delta math to differentiate & individualize instruction ● IEP/504/DCAP accommodations ● Cotaught student accommodations