

Educational Epiphany™

Districtwide PLC Protocol for Mathematics

Teacher/Teacher Team:
Grade/Course: Algebra II
Date: Week of October 24, 2022

#	Planning Question	Teacher/Teacher Team Response	
<u>Algebra 2 Coherence Tool:</u> Access the foundational standards to make connections to previously taught skills during the lesson introduction.			
1	Which state standard is your lesson progression addressing?	Lesson 3.7 – Transformations of Polynomial Functions A2.F.BF.B.3 Identify the effect on the graph of replacing $f(x)$ with $f(x) + k$, $kf(x)$, $f(kx)$, 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. Foundational Standard: A1.F.IF.C.6a	Lesson 4.1 – Inverse Variation and Reciprocal Functions A2.F.BF.B.3 Identify the effect on the graph of replacing $f(x)$ with $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs Foundational Standard: A1.A.CED.A.4
2	What mathematical concepts are embedded in the state standard?	Understand that: - Polynomial functions are categorized as even, odd, or neither. Even functions are symmetric about the y-axis, and for all x in the domain, $f(x) = f(-x)$. Odd functions are symmetric about the origin, and for all x in the domain, $f(-x) = -f(x)$ - Students determine whether a polynomial function is even, odd, or neither by interpreting the meaning of the cemetery and degree of the function. A function is even if it is symmetric about the y-axis, odd if it is symmetric about the origin. - Students graph, identify, and apply transformations of cubic and quartic functions.	Understand that: - The reciprocal function is used to model inverse variation, which is a proportional relationship between two variables such that when one variable increases, the other decreases. - Students write and graph the reciprocal function and relationships that represent inverse variation. They also identify the x- and y-asymptotes and the end behavior of each function. - students determine how the graph changes when the reciprocal function is transformed comma using the function $f(x) = \frac{1}{x-h} + k$. They recognize that the value of h translates the graph horizontally and the value of k shifts the graph vertically.
3	What teacher knowledge, reminders, and misconceptions are assumed in the standard?	Knowledge: - Students should understand how the sign of the leading coefficient affects the end behavior of polynomials. - Students should understand how to sketch a rough graph of a polynomial using the zeros and turning points of the function. - Identify transformations of polynomial functions related to parent cubic or quartic functions. - Connect the study of transformations in Geometry with the transformations of graphs.	Knowledge: - Students should be able to determine whether a relationship represents an inverse variation. - Students should be able to substitute values into an inverse equation and solve for a missing variable. - Students should be able to apply variation to real-world situations. - Students should be able to graph translations of the parent function of the reciprocal function and identify asymptotes.

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		Reminders: - Make connections between symmetry and transformations represented both graphically and algebraically. Misconceptions: - Students frequently see $f(x + k)$ as a horizontal shift to the right k units.	Reminders: - Students should understand the relationship between inverse variation and the reciprocal function. Misconceptions: - Misconceptions may occur when identify the type of variation a table of values represents.
4	What objective(s) must be taught? In what order? Why?	PBO: SWBAT determine if the function is an odd function, even function, or neither, given a function defined by an expression IOT determine the graph the function. SWBAT describe the effect on the graph of replacing $f(x)$ with $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative) IOT understand and explain the differences of the transformations to $f(x)$. Lesson objectives: - Recognize even and odd functions from their graphs and algebraic equations. - Identify the effect on the graphs of cubic and quartic functions of replacing $f(x)$ with $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$	PBO: SWBAT describe the effect on the graph of replacing $f(x)$ with $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative) IOT understand and explain the differences of the transformations to $f(x)$. Lesson objectives: - Use inverse variation to write and graph the reciprocal function. - Identify the effect of transformations on the graph of the reciprocal function and define the effects of h and k on the function $f(x) = \frac{1}{x-h} + k$
5	What academic language must be taught before the teacher models for students? How will the academic language be taught and assessed ?	Academic Language: Determine – to find out something using mathematical processes; to conclude after reasoning; to figure out Even function – is symmetric to the y-axis, and whose domain values are opposite and range values are the same; $f(-x) = f(x)$ Expression – a group of mathematical numbers and/or symbols representing a number or quantity Function – a relation in which every domain(input) value is paired with exactly one range(output) value Graph – a pictorial diagram used to show a numerical relationship using distinctive plots. lines, bars, etc. Odd function – is symmetric to the origin, and the input and output values are both opposites; $f(-x) = -f(x)$ Understand – comprehend; grasp the intended meaning of; infer something from information received Describe – give an account in words of (someone or something) that includes all the relevant characteristics Explain – make clear by describing Transformation – the mapping, or movement, of all points of a figure in a plane according to a common operation	Academic Language: Describe – give an account in words of (someone or something) that includes all the relevant characteristics Explain – make clear by describing Graph – a pictorial diagram used to show a numerical relationship using distinctive plots. lines, bars, etc. Transformation – the mapping, or movement, of all points of a figure in a plane according to a common operation Understand – comprehend; grasp the intended meaning of; infer something from information received - paired with exactly one range(output) value Reciprocal Function – A reciprocal function belongs to the family whose parent function is $f(x) = \frac{1}{x}$ where $x \neq 0$ Asymptote – A line that the graph of a function gets closer to as x or y gets larger in the absolute value. Constant of Variation – The constant of variation is the ratio of the two variables in a direct variation and the product of the two variables in an inverse variation Inverse Variation – A relation represented by an equation of the form $xy = k$, $y = \frac{k}{x}$, or $x = \frac{k}{y}$ where $k \neq 0$

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		Instructional Practice 2: Strategies used to teach unfamiliar words will include: • 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) • Point of Use Annotation of the Performance-Based Objective • Universal Language of Literacy • Word and Definition Walls • Word Parts • Context Clues • Point of Use Annotation of the Text (in Real-Time)	Instructional Practice 2: Strategies used to teach unfamiliar words will include: • 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) • Point of Use Annotation of the Performance-Based Objective • Universal Language of Literacy • Word and Definition Walls • Word Parts • Context Clues • Point of Use Annotation of the Text (in Real-Time)
6	What practice problems are you planning to use for the I Do, We Do, You Do in Pairs and You Do Without Assistance? What did you learn from working the problems in advance of using them in class with students?	Station Rotation Model Suggestions Teacher-Led Station: Teachers can work with students on additional We Do problems. • 3-7 Reteach to Build Understanding Online Station: Students can engage with the Savvas Realize Explore & Reason, engage with MathXL for School: Additional Practice, or watch and engage with a Virtual Nerd Video • 3-7 Explore & Reason • 3-7: Math XL for School: Additional Practice • Virtual Nerd: What is the Parent Function of a Cubic Function? • Virtual Nerd: How Do You Translate a Polynomial Function Horizontally Offline Station: Students would complete problems and exercises selected for the You Do in Pairs part of the lesson. • Lesson Performance Task #27 – Pg. 186 • 3-7 Additional Practice	Station Rotation Model Suggestions Teacher-Led Station: Teachers can work with students on additional We Do problems. • 4-1 Reteach to Build Understanding Online Station: Students can engage with the Savvas Realize Model & Discuss, engage with MathXL for School: Additional Practice, or watch and engage with a Virtual Nerd Video • 4-1 Model & Discuss • 4-1: Math XL for School: Additional Practice • Virtual Nerd: How Do You Use the Product Rule for Inverse Variation? • Virtual Nerd: How Do You Graph an Inverse Variation Equation Using a Table? Offline Station: Students would complete problems and exercises selected for the You Do in Pairs part of the lesson. • Lesson Performance Task #26 – Pg. 200 • 4-1 Additional Practice
7	What manipulatives might be integrated into the gradual release of responsibility (I Do, We Do,	Reference: Interactive Manipulatives • Didax Virtual Manipulatives • Savvas Math Tools • Realize Desmos (Graphing Calculator)	Reference: Interactive Manipulatives • Didax Virtual Manipulatives • Savvas Math Tools • Realize Desmos (Graphing Calculator)

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	You Do in Pairs, You Do Without Assistance)? What did you learn from using the manipulatives in advance of using them in class with students?	• Realize Desmos (Scientific Calculator)	• Realize Desmos (Scientific Calculator)
8	What graphic organizer(s) might support students' conceptual understanding of the process outlined by the performance-based objective(s)?	Reference: • Graphic Organizer Templates • Google Drawing Graphic Organizers • Teacher Vision	Reference: • Graphic Organizer Templates • Google Drawing Graphic Organizers • Teacher Vision

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