Understanding by Design: School _MHHS_____

Designer Name(s): Jan Hughes Date:

Subject Area: Algebra 2 Grade Level(s):

Unit Title/Focus: Families of Functions 1

Estimated Amount of Instructional Time: ~5 days

Stage 1 – (Desired Results)

State Content and Skill Standards:

F.IF.1 – Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*).

F.IF.2 – Use function notation; evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.5 – Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★

F.IF.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 and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

F.IF.9 – Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

F.BF.3 – Identify the effect on the graph of replacing *f*(*x*) by *f*(*x*) + *k*, *k f*(*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. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*

A.CED.2 – Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Enduring Understandings: (what are the big ideas, what are the specific understandings desired)	*Essential Questions: (what questions will foster inquiry, understanding, and transfer of learning)*
Students will understand that… - Relations can be represented using ordered pairs, mappings, tables of values, equations, or graphs. - There are families of functions in which each function is a transformation of the parent function. - Just as the absolute value of x is its distance from 0, the absolute value of f(x) gives the distance from the line y=0 for each value of x. - For any quadratic function $f(x) = ax^2 + bx + c$, the values of a, b, and c provide key information about its graph.	- How can you tell which relations are functions? - How do you use transformations to help graph functions? - What do the graphs of the parent functions for absolute value and quadratic functions look like?
What Students will know: (what knowledge will they acquire)	*What Students will be able to do: (what will they eventually be able to do as a result of their skills learned/knowledge)*
- Key Terms – absolute value function, axis of symmetry, dependent variable, domain, function, function notation, independent variable, maximum value, minimum value, parabola, parent function, quadratic function, range, reflection, relation, standard form, transformation, translation, vertex, vertex form, vertical compression/stretch, vertical line test - General forms of absolute value and quadratic functions	- Graph relations from various representations - Determine whether a given relation is a function - Analyze transformations of functions - Identify and graph absolute value and quadratic, functions - Write an equation to represent a given function based on its graph

Stage 2 - Assessment Evidence (acceptable assessment evidence that students understand)

Performance Tasks: (what authentic performance task (s) will students demonstrate understanding; by what criteria will it be judged?)	*Other Evidence: (quizzes, tasks, academic prompts, homework, observations)*

Stage 3 - Learning Plan (sequence of teaching and learning activities that will produce desired understandings, engagement and development):

Day 1- Properties of Functions *Pearson 2-1 (reinforces Saxon Lesson 4)*
- Representing a relation
- Finding domain & range
- Identifying functions
- Using function notation
- Writing & evaluating a function

Day 2 – Families of Functions *Pearson 2-6*
- Horizontal & vertical translations
- Reflections
- Vertical stretch or compression
- Combinations of transformations

Day 3 – Absolute Value Functions *Pearson 2-7*
- The absolute value parent function
- The family of absolute value functions
- General form of absolute value functions

Day 4 – Quadratic Functions *Pearson 4-1, Saxon 27 & 30*
- The quadratic parent function
- Reflecting, stretching, and compressing quadratic functions
- Translating quadratic functions
- Vertex form of quadratic functions

Day 5 – Standard Form of Quadratic Functions *Pearson 4-2 Saxon 27 & 30*
- Features of quadratic functions in standard form
- Graphing a function in standard form
- Converting standard form to vertex form
- Interpreting a quadratic graph

W=help the students know WHERE the unit is going and WHAT is expected/Help teacher to know where the students are coming from (prior knowledge, interests)
H=HOOK all students and hold their interest
E=EQUIP students, help them EXPERIENCE the key ideas and EXPLORE the issue
R=Provide opportunities to RETHINK and REVISE their understanding/work
E (2)=Allow students to EVALUATE their work
T=Be TAILORED (personalized) to different needs, interests, and abilities of learners
O=Be ORGANIZED to maximize initial and sustained engagement as well as effective learning

Assessment Tasks that Provide Evidence for Claims including DOK	**Claim #1/DOK 1, 2, 3, 4 (circle one):** **Claim #2/DOK 1, 2, 3, 4 (circle one):** **Claim #3/DOK 1, 2, 3, 4 (circle one):** **Claim #4/DOK 1, 2, 3, 4 (circle one):**
Achievement Level Descriptors	**ALD #1: ALD #2: ALD #3: ALD #4: (circle one):**
Materials/Resources	