Pre-Calculus H Unit 1: Algebraic Concepts

AVON PUBLIC SCHOOLS

Unit #:	APSDO-00018117	Duration:	3.0 Week(s)	Date(s):	

Team:
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Grades:
10, 11, 12
Subjects:
Mathematics

Unit Focus

In this unit, students will review Algebra 2 concepts such as solving systems of equations, piecewise functions, function notation, and quadratic functions. Students will also be introduced to matrices and partial fraction decomposition. Students will state domain, range and critical points of functions. Summative assessments may include projects, labs and test. Primary instructional materials for this unit include Pre-Calculus with Limits, Larson, Hostetler, and Edwards, 2008.

Stage 1: Desired Results - Key Understandings

Established Goals

Common Core
Mathematics: 11

- Graph linear and quadratic functions and show intercepts, maxima, and minima. *CCSS.MATH.CONTENT.HSF.IF.C.7.A*
- 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).

Transfer

T1 (T50) Based on an understanding of any problem, initiate a plan, execute it and evaluate the reasonableness of the solution.
T2 (T53) Articulate how mathematical concepts relate to one another in the context of a problem or in the theoretical sense.
T3 (T51) Examine alternate methods to accurately and efficiently solve problems.
T4 (T52) Use appropriate tools strategically to deepen understanding of mathematical concepts.
T5 (T22) Describe and/or solve problems using algebraic expressions, equations, inequalities, and functions.
T6 (T23) Use functions or equations to model relationships among quantities.

Meaning

Understandings	Essential Questions

CCSS.MATH.CONTENT.HSF.IF.A.1 • 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. *CCSS.MATH.CONTENT.HSF.IF.C.8.A* • Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *CCSS.MATH.CONTENT.HSA.CED.A.2* • Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. *CCSS.MATH.CONTENT.HSF.IF.C.7.B* • Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. *CCSS.MATH.CONTENT.HSF.IF.A.2* • Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. *CCSS.MATH.CONTENT.HSF.IF.B.6* • Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. *CCSS.MATH.CONTENT.HSA.REI.C.6* • Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x2 + y2 = 3$. *CCSS.MATH.CONTENT.HSA.REI.C.7* *Mathematics: 12*	**U1** (U205) Expressions, equations, inequalities, and functions use symbols to represent quantities, operations, and their relationships. **U2** (U206) A function can represent how quantities in the real world relate to one another. **U3** (U502) Effective problem solvers identify and apply an appropriate model, tool, or strategy. **U4** (U511) Placing a problem in a category gives you a familiar approach to solving it.	**Q1** (Q205) How can I represent this relationship as a function or equation? (Gr. 6-12) **Q2** (Q206) How do I evaluate this function or solve the equation? (Gr. 6-12) **Q3** (Q503) What strategies/approaches are best for this problem? **Q4** (Q511) What characteristics/attributes define this type of problem?

Acquisition of Knowledge and Skill

Knowledge	Skills
	S1 Write the equation of line **S2** Write equations of parallel and perpendicular lines **S3** Graph piecewise functions including linear, absolute, and quadratic functions **S4** Evaluate functions in function notation **S5** Simplify difference quotient **S6** Identify domain of functions **S7**

- Factor a quadratic expression to reveal the zeros of the function it defines. *CCSS.MATH.CONTENT.HSA.SSE.B.3.A* - 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). *CCSS.MATH.CONTENT.HSF.IF.A.1* - 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. *CCSS.MATH.CONTENT.HSF.IF.C.8.A* - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *CCSS.MATH.CONTENT.HSA.CED.A.2* - Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. *CCSS.MATH.CONTENT.HSA.REI.D.12* - Solve quadratic equations by inspection (e.g., for $x2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a +/- bi for real numbers a and b. *CCSS.MATH.CONTENT.HSA.REI.B.4.B* - Represent constraints by equations or		Graph and write quadratics in standard and vertex form **S8** Identify x-and y-intercepts of quadratic function **S9** Solve application problems using quadratic functions **S10** Apply concepts of maximum and minimum values of functions **S11** Algebraically solve systems involving polynomial, rational, and square root functions and conic sections **S12** Apply systems of equations to solve applications **S13** Find the partial fraction decomposition of rational functions

inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *CCSS.MATH.CONTENT.HSA.CED.A.3*
- Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. *CCSS.MATH.CONTENT.HSA.REI.C.6*
- Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. *CCSS.MATH.CONTENT.HSA.APR.D.7*
- Make sense of problems and persevere in solving them. *CCSS.MATH.MP.1*
- Reason abstractly and quantitatively. *CCSS.MATH.MP.2*

Stage 3: Learning Plan

Coding	Code	Description of Learning Activity