



Pre-College Algebra & Trigonometry - Unit 3 - Functions and Transformations

Unit Focus

Students will understand the importance of functions - they give us the ability to predict because they have only one output given an input. There is an emphasis on input/output language throughout unit. Piecewise, compositions, and inverses are explored. A significant part of this unit is about transformations, having students understand how parameters affecting the inputs differ from the parameters affecting the outputs. The ABCD method of transforming functions (with point mapping) will really help for when many different parameters are used at once. Graph analysis is introduced but somewhat limited in scope.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - 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. (CCSS.MATH.CONTENT.HSF.IF.B.4) - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (CCSS.MATH.CONTENT.HSF.IF.B.5) - Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. (CCSS.MATH.CONTENT.HSF.IF.C.7.B) - Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. (CCSS.MATH.CONTENT.HSF.IF.C.7.C) - 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. (CCSS.MATH.CONTENT.HSF.BF.B.3) - Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$. (CCSS.MATH.CONTENT.HSF.BF.B.4.A) - Verify by composition that one function is the inverse of another. (CCSS.MATH.CONTENT.HSF.BF.B.4.B) - Read values of an inverse function from a graph or a table, given that the function has an inverse. (CCSS.MATH.CONTENT.HSF.BF.B.4.C)	<i>Students will be able to independently use their learning to...</i> T1 use appropriate tools to make reaching solutions more efficient, accessible and accurate. T2 draw conclusions about graphs, shapes, equations, or objects.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Parameters have various transforming effects on a function. U2 Function notation simply defines which function and what input to use.	<i>Students will keep considering...</i> Q1 How do I know I've solved the problem right? Q2 What is the most efficient way to solve this problem? Q3 How do predictable patterns help us simplify tasks?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 functions can be used for making predictions in math K2 the domain of a function are the possible inputs for which outputs exist K3 inverses swap inputs and outputs K4 How the parameters of a function change the parent function graph	<i>Students will be skilled at...</i> S1 using interval notation S2 reading and representing function notation S3 interpreting characteristics of graphs S4 graphing and evaluating piecewise functions S5 graphing inverse functions

Stage 1: Desired Results - Key Understandings

- Produce an invertible function from a noninvertible function by restricting the domain. (CCSS.MATH.CONTENT.HSF.BF.B.4.D)
- Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)
- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Use appropriate tools strategically. (CCSS.MATH.MP.5)
- Look for and make use of structure. (CCSS.MATH.MP.7)

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- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

K5 Vocabulary: function, inverse function, piecewise function, transformation, interval notation, function notation, symmetry, continuous, domain, range, intercept, inequality, input, output, composition, composite function, parent functions, inverse, reflection, shift, parameter

S6 find and verify inverse functions
S7 function composition
S8 function transformations