# HPISD Curriculum: Pre Calculus Pre-AP

| Title | Estimated Duration | 6 Weeks | | | | | |
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| Unit 9: Special Functions | 11 days | 1 | 2 | 3 | **4** | 5 | 6 |

## Unit Overview

Functions

## Generalizations/Enduring Understandings

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| The student will understand that: | • Functions can be graphed using transformations.<br>• One-to-one functions are a subset of functions and can be determined using the horizontal line test.<br>• Composite functions combine two or more functions to form one function.<br>• Functions can be graphed using symmetry.<br>• Functions can have inverses. |

| Concepts | Guiding/Essential Questions |
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| • Functions | • How can transformations be used to graph functions?<br>• What is special about one-to-one functions?<br>• How are composite functions created?<br>• Which functions have symmetry and how can I use symmetry to graph?<br>• Which functions have inverses? |

## Learning Targets

- Students will select the correct parent function and transform it to create all the related function graphs.
- Students will combine two or more functions to create a new composite function.
- Students will select the functions that contain symmetry and use symmetry to graph the function.
- Students will show that if two functions are inverses of each other, their composition gives the identity function, f(x) = x.

| Formative Assessments | Summative Assessments |
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| **TEKS:** | **Processes and Skills:**<br>**What students should be able to DO** | **Facts:**<br>**What students should KNOW** |
|---|---|---|
| Use the composition of two functions to model and solve real-world problems. **P.2.A**<br>Demonstrate that function composition is not always commutative. **P.2.B**<br>Represent a given function as a composite function of two or more functions. **P.2.C**<br>Describe symmetry of graphs of even and odd functions. **P.2.D**<br>Determine an inverse function, when it exists, for a given function over its domain or a subset of its domain and represent the inverse using multiple representations. **P.2.E**<br>Graph exponential, logarithmic, rational, polynomial, power, trigonometric, inverse trigonometric and piecewise defined functions, including step functions. **P.2.F**<br>Graph functions, including exponential, logarithmic, sine, cosine, rational, polynomial, and power functions and their transformations, including af(x), f(x)+d, f(x-c), f(bx) for specific values of a, b, c, and d, in mathematical and real-world problems. **P.2.G**<br>Determine and analyze the key features of exponential, logarithmic, rational, polynomial, power, trigonometric, inverse trigonometric, and piecewise defined functions, including step functions such as domain, range, symmetry, relative maximum, relative minimum, zeros, asymptotes, and intervals over which the function is increasing or decreasing. **P.2.I**<br>Determine various types of discontinuities in the interval $(-\infty,\infty)$ as they relate to functions such as rational and piecewise defined functions and explore the limitations of the graphing calculator as it relates to the behavior of the function around discontinuities. **P.2.L** | • Graph functions by transformation of the parent functions.<br>• Use the horizontal line test to determine if a function is one-to-one.<br>• Create composite functions from two or more functions.<br>• Find the inverse of a function.<br>• Determine if a function has symmetry.<br>• Describe and graph the greatest integer function.<br>• Write a function from a verbal description. | • Transformations are read from the expression, for example, in the following function notation, $3[f(4(x + 2))] – 5$; 3 represents a vertical stretch, 4 represents a horizontal shrink, 2 represents a horizontal shift and -5 represents a vertical shift.<br>• If a horizontal line can be drawn so that it intersects more than one section of the graph, then the function is not one-to-one.<br>• Even functions, $f(-x) = f(x)$ have symmetry about the y-axis while odd functions $f(-x) = -f(x)$ have symmetry about the origin<br>• The graph of a function and its inverse are reflections across the line $y = x$<br>• The greatest integer function is also called the "step function". |

| Topics | |
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| Functions | |
| **Language of Instruction** | |
| greatest integer function<br>inverse functions<br>one-to-one functions | |
| **State Assessment Connections** | **National Assessment Connections** |
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| **Resources** | |
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