Interpret functions that arise in applications in terms of a context (F.IF.4-6)	
Standard III.F.IF.4: 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. *Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ⬚	
Concepts and Skills to Master	
- Build on work from Secondary Mathematics I and Secondary Mathematics II to interpret key features of functions, including all polynomial, rational, square root, cube root, logarithmic, and trigonometric functions. - Identify key features such as intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. - Interpret key features using multiple representations (tables, graphs, equations, and verbal descriptions). - Use key features to sketch a graph of the function.	
Related Standards: Current Course	Related Standards: Future Courses
III.F.IF.4, III.F.IF.6, III.F.IF.7	P.F.IF.7,

Support for Teachers

Critical Background Knowledge
- Interpret key features of graphs and tables (I.F.IF.4 and II.F.IF.4)   - Find the average rate of change on a specified interval (I.F.IF.6 and II.F.IF.6)   - Graph functions and identify key features (I.F.IF.7 and II.F.IF.7)   - Compare functions using key features (I.F.IF.9 and II.F.IF.9)   - Graph and identify key features of linear, exponential, and quadratic functions (I.F.IF.4, II.F.IF.4).
Academic Vocabulary
asymptote, removable discontinuity, increasing, decreasing, interval, intercept, maximum, minimum, symmetry, end behavior, rational, discrete, domain, range
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Interpret functions that arise in applications in terms of a context (F.IF.4-6)	
Standard III.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.* ⬚	
Concepts and Skills to Master	
• Identify domain of a function from any representation for any function family from Secondary Mathematics. • Relate the domain to context, explaining restrictions as a result of the context.	
Related Standards: Current Course	Related Standards: Future Courses
III.A.CED.2, III.F.BF.4, All functions standards (domain is used throughout high school mathematics courses)	P.F.BF.4, P.F.IF.7d, All functions standards (domain is used throughout high school mathematics courses)

Support for Teachers

Critical Background Knowledge
• Relate the domain of a function to the relationship it describes (I.F.IF.5 and II.F.IF.5) • Familiarity with function notation and domain (I.F.IF.2) • Understand the definition of function (8.F.1 and I.F.IF.1) • Independent, dependent variables and input/output (8.F.1)
Academic Vocabulary
domain, function, discrete, continuous, asymptotes
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Interpret functions that arise in applications in terms of a context (F.IF.4-6)
Standard III.F.IF.6: 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.

Concepts and Skills to Master
- Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Focus on all function families from Secondary Mathematics.   - Estimate the rate of change from a graph.

Related Standards: Current Course	Related Standards: Future Courses
III.F.IF.9, III.F.LE.3	Secant lines in Calculus

Support for Teachers

Critical Background Knowledge
- Calculating and interpreting the rate of change in linear, exponential, and quadratic functions (I.F.IF.6 and II.F.IF.6)   - Determine the rate of change from a description of a relationship or from two (x,y) values and interpret its meaning (8.F.4)

Academic Vocabulary
average rate of change, interval, secant line

Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Analyze functions using different representations (F.IF.7-9)

Standard III.F.IF.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ⬛
 	
    b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Compare and contrast square root, cubed root, and step functions with all other functions.
 	
    c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
 	
    d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
 	
    e. Graph exponential and logarithmic functions, showing intercepts and end behavior; and trigonometric functions, showing period, midline, and amplitude.

Concepts and Skills to Master
• Given an equation of any function from this standard, graph with or without technology, and show key features of given function. • Compare and contrast new functions from Secondary III with all other functions.

Related Standards: Current Course	Related Standards: Future Courses
III.A.CED.2, III.F.IF.4, III.F.BF.3, III.F.BF.4, III.F.TF.5	P.F.IF.7, P.F.TF.4, P.F.TF.6, P.G.GPE.2, P.G.GPE.3

Support for Teachers

Critical Background Knowledge
• Graph functions showing key features (I.F.IF.7 and II.F.IF.7) • Interpret key features of a graph (I.F.IF.4 and II.F.IF.4) • Identify and use transformation of functions (I.F.BF.3 and II.F.BF.3)
Academic Vocabulary
square root, cube root, piecewise, logarithmic, step, period, midline, amplitude, frequency
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Analyze functions using different representations (F.IF.7-9)
Standard III.F.IF.8: Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

Concepts and Skills to Master
- Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.   - Extend the work from Secondary II (II.F.IF.8) to include functions from this course.   - Transition between equivalent forms to identify desired key features

Related Standards: Current Course	Related Standards: Future Courses
III.A.SSE.1, III.A.SSE.2, III.A.APR.3, III.A.APR.4, III.A.APR.6, III.F.BF.3	P.F.IF.7d

Support for Teachers

Critical Background Knowledge
- Identify when two expressions are equivalent (6.EE.4); understand that rewriting an expression in different forms can shed light on problem and how quantities are related (7.EE.2)   - Write a quadratic function in different but equivalent forms (II.F.IF.8)
Academic Vocabulary
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Analyze functions using different representations (F.IF.7-9)
Standard III.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.*

Concepts and Skills to Master
- Compare properties of two functions, keeping the following in mind: - properties include key features from III.F.IF.4   - function pairs include any combination of functions from Secondary Mathematics I, II, and III   - representations include algebraically, graphically, numerically in tables, or by verbal descriptions

Related Standards: Current Course	Related Standards: Future Courses
III.F.IF.4, III.F.IF.7, III.F.LE.3	P.F.IF.7

Support for Teachers

Critical Background Knowledge
- Compare properties of two functions in different representations (I.F.IF.9 and II.F.IF.9)   - Find intercepts, rates of change, and end behavior (I.F.IF.4 and II.F.IF.4)
Academic Vocabulary
asymptote, discontinuity, period, midline, amplitude, frequency
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625