2021-2022 Scope and Sequence
Mathematics – Precalculus

Cycle 1	27 Days	The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.
	Aug. 23 - Oct. 1, 2021	

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course.
		The student will:
		The Mathematical Process Standards are integrated throughout the course in all activities and lessons. Teachers should refer to these standards for instructional strategies and depth of rigor. Specific process standards have been highlighted for each unit, but these process standards should not be the only process standards associated with the daily lessons.
		Mathematical Process Standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:
		℗ˢ **PC.1A** Apply mathematics to problems arising in everyday life, society, and the workplace.
		℗ˢ **PC.1B** Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.
		℗ˢ **PC.1C** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems.
		℗ˢ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
		℗ˢ **PC.1E** Create and use representations to organize, record, and communicate mathematical ideas.
		℗ˢ **PC.1F** Analyze mathematical relationships to connect and communicate mathematical ideas.
		℗ˢ **PC.1G** Display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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2021-2022 Scope and Sequence
Mathematics – Precalculus

Cycle 1	27 Days	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days.*
	Aug. 23 - Oct. 1, 2021	*Complete instructional planning information and support are in the HISD Curriculum documents.*

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 1: Values of Trigonometric Functions Students determine the relationships among the unit circle, trigonometric functions, and trigonometric values when given measurements in degrees, minutes, and seconds or radians based on the unit circle.	**4** class periods (90-min. each) or **8** class periods (45-min. each) *Enrichment Opportunities Aug. 2-13* *Teachers Report to Work Aug. 16* *Teacher Service Days Aug. 16-17, Aug. 19-20* *Teacher Prep Day (no students) Aug. 18* *Labor Day Sept. 6* *Fall Holiday Sept. 16* *Teacher Service Day (no students) Sept. 17*	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: (PS) **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. (PS) **PC.1E** Create and use representations to organize, record, and communicate mathematical ideas. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2P** Determine the values of the trigonometric functions at the special angles and relate them in mathematical and real-world problems. **Number and Measure.** The student uses process standards in mathematics to apply appropriate techniques, tools, and formulas to calculate measures in mathematical and real-world problems. The student is expected to: • **PC.4A** Determine the relationship between the unit circle and the definition of a periodic function to evaluate trigonometric functions in mathematical and real-world problems. • **PC.4B** Describe the relationship between degree and radian measure on the unit circle. • **PC.4C** Represent angles in radians or degrees based on the concept of rotation and find the measure of reference angles and angles in standard position. • **PC.4E** Determine the value of trigonometric ratios of angles and solve problems involving trigonometric ratios in mathematical and real-world problems. • **PC.4I** Use vectors to model situations defined by magnitude and direction.

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| **Cycle 1** | **27 Days** | *The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days.* |
| | Aug. 23 - Oct. 1, 2021 | *Complete instructional planning information and support are in the HISD Curriculum documents.* |

Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)**
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course.
		The student will:
Unit 2: Graphs and Properties of Trigonometric Functions Students convert degrees to radians and use them to derive the six trigonometric functions, their graphs, and transformations.	**5** class periods (90-min. each) or **10** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1C** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems. ⓅⓈ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2F Graph** exponential, logarithmic, rational, polynomial, power, **trigonometric**, inverse trigonometric, and piecewise-defined functions, including step functions. • **PC.2G 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**. • **PC.2I 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.** • **PC.2J Analyze and describe end behavior of functions**, including exponential, logarithmic, rational, polynomial, and power functions, **using infinity notation to communicate this characteristic in mathematical and real-world problems.** • **PC.2O** Develop and use a sinusoidal function that models a situation in mathematical and real-world problems. **Number and Measure.** The student uses process standards in mathematics to apply appropriate techniques, tools, and formulas to calculate measures in mathematical and real-world problems. The student is expected to:

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| Cycle 1 | 27 Days | *The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days.* |
| | Aug. 23 - Oct. 1, 2021 | *Complete instructional planning information and support are in the HISD Curriculum documents.* |

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course.
		The student will:
		• **PC.4A** Determine the relationship between the unit circle and the definition of a periodic function to evaluate trigonometric functions in mathematical and real-world problems.
Unit 3: Inverse of the Trigonometric Functions Students graphically, tabularly, and algebraically analyze the inverse of the trigonometric functions.	**2** class periods (90-min. each) or **4** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: Ⓟⓢ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. Ⓟⓢ **PC.1G** Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2A** Use the composition of two functions to model and solve real-world problems. • **PC.2B** Demonstrate that function composition is not always commutative. • **PC.2C** Represent a given function as a composite function of two or more functions. • **PC.2E** 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. • **PC.2F Graph** exponential, logarithmic, rational, polynomial, power, trigonometric, **inverse trigonometric**, and piecewise-defined functions, including step functions. • **PC.2H** Graph arcsin *x* and arccos *x* and describe the limitations on the domain. • **PC.2I 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.**

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Cycle 2	29 Days	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Oct. 5 - Nov. 12, 2021	

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course.
		The student will:
Unit 4: Trigonometric Identities Students analyze and transform trigonometric functions and identities.	**4** class periods (90-min. each) or **8** class periods (45-min. each) *Teacher Service Day (no students) Oct. 4*	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1C** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems. ⓅⓈ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. **Algebraic Reasoning.** The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms. The student is expected to: • **PC.5M** Use trigonometric identities such as reciprocal, quotient, Pythagorean, cofunctions, even/odd, and sum and difference identities for cosine and sine to simplify trigonometric expressions. • **PC.5N** Generate and solve trigonometric equations in mathematical and real-world problems.
Unit 5: Trigonometric Equations Students analyze and solve trigonometric equations.	**4.5** class periods (90-min. each) or **9** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace. ⓅⓈ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. **Number and Measure.** The student uses process standards in mathematics to apply appropriate techniques, tools, and formulas to calculate measures in mathematical and real-world problems. • **PC.4B** Describe the relationship between degree and radian measure on the unit circle. **Algebraic Reasoning.** The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms. The student is expected to:

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Cycle 2	29 Days	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Oct. 5 - Nov. 12, 2021	

Unit	# Class Periods	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
		• **PC.5M** Use trigonometric identities such as reciprocal, quotient, Pythagorean, cofunctions, even/odd, and sum and difference identities for cosine and sine to simplify trigonometric expressions. • **PC.5N** Generate and solve trigonometric equations in mathematical and real-world problems.
Unit 6: **Applications of Trigonometric Functions** Students apply and analyze trigonometric functions to solve real-world problems.	**3.5** class periods (90-min. each) or **7** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: Ⓟ**PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace. Ⓟ**PC.1F** Analyze mathematical relationships to connect and communicate mathematical ideas. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2O** Develop and use a sinusoidal function that models a situation in mathematical and real-world problems. • **PC.2P** Determine the values of the trigonometric functions at the special angles and relate them in mathematical and real-world problems. **Number and Measure.** The student uses process standards in mathematics to apply appropriate techniques, tools, and formulas to calculate measures in mathematical and real-world problems. The student is expected to: • **PC.4B** Describe the relationship between degree and radian measure on the unit circle. • **PC.4D** Represent angles in radians or degrees based on the concept of rotation in mathematical and real-world problems, including linear and angular velocity. • **PC.4E** Determine the value of trigonometric ratios of angles and solve problems involving trigonometric ratios in mathematical and real-world problems. • **PC.4F** Use trigonometry in mathematical and real-world problems, including directional bearing. • **PC.4G** Use the law of sines in mathematical and real-world problems.

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Cycle 2	**29 Days**	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Oct. 5 - Nov. 12, 2021	

Unit	# Class Periods	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
		• **PC.4H** Use the law of cosines in mathematical and real-world problems. • **PC.4J** Represent the addition of vectors and the multiplication of a vector by a scalar geometrically and symbolically. • **PC.4K** Apply vector addition and multiplication of a vector by a scalar in mathematical and real-world problems.

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Cycle 3	30 Days	The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.
	Nov. 15, 2021 - Jan. 14, 2022	

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs) The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 7: Composition of Functions and Inverses Students analyze the composition of functions, the inverse of a function, and the importance of the relationship between their respective domains and ranges.	**2** class periods (90-min. each) or **4** class periods (45-min. each) *Thanksgiving Break Nov. 22-26* *Enrichment Opportunities Dec. 20-21* *Winter Break Dec. 20-31* *MLK Jr. Day Jan. 17* *Teacher Prep Day (no students) Jan. 18*	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1C** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems. ⓅⓈ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2A** Use the composition of two functions to model and solve real-world problems. • **PC.2B** Demonstrate that function composition is not always commutative. • **PC.2C** Represent a given function as a composite function of two or more functions. • **PC.2E** Determine an inverse function, when it exits, for a given function over its domain or a subset of its domain and represent the inverse using multiple representations.
Unit 8: Attributes of Piecewise and Step Functions Students analyze attributes of piecewise and step functions in relation to real-world situations.	**4** class periods (90-min. each) or **8** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace. ⓅⓈ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.

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Cycle 3	**30 Days**	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Nov. 15, 2021 - Jan. 14, 2022	

Unit	# Class Periods	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
		Functions. The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2F Graph** exponential, logarithmic, rational, polynomial, power, trigonometric, inverse trigonometric, and **piecewise-defined functions, including step functions**. • **PC.2I 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.**
Unit 9: Polynomial and Power Functions in the Real World Students analyze polynomial and power functions, their transformations using graphs, tables, and algebraic properties, and real-world situations.	**4** class periods (90-min. each) or **8** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ℗ˢ **PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace**.** ℗ˢ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2D** Describe symmetry of graphs of even and odd functions. • **PC.2F Graph** exponential, logarithmic, rational, **polynomial**, **power**, trigonometric, inverse trigonometric, and piecewise-defined functions, including step functions. • **PC.2G 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.

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Cycle 3	**30 Days**	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Nov. 15, 2021 - Jan. 14, 2022	

Unit	# Class Periods	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
		PC.2I 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.** **PC.2J Analyze and describe end behavior of functions**, including exponential, logarithmic, rational, **polynomial**, **and power functions**, **using infinity notation to communicate this characteristic in mathematical and real-world problems.** **PC.2N Analyze situations modeled by functions**, including exponential, logarithmic, rational, **polynomial**, **and power functions, to solve real-world problems**. **Algebraic Reasoning.** The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms. The student is expected to: **PC.5J** Solve polynomial equations with real coefficients by applying a variety of techniques in mathematical and real-world problems. **PC.5K** Solve polynomial inequalities with real coefficients by applying a variety of techniques and write the solution set of the polynomial inequality in interval notation in mathematical and real-world problems.

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Cycle 4	27 Days	The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.
	Jan. 19 - Feb. 25, 2022	

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 10: Rational Functions Students analyze characteristics of rational functions through graphs, tables, and algebraic methods in real-world situations.	**4** class periods (90-min. each) or **8** class periods (45-min. each) *Teacher Service Day/Presidents' Day (no students) Feb. 21*	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: Ⓟ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. Ⓟ **PC.1E** Create and use representations to organize, record, and communicate mathematical ideas. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2D** Describe symmetry of graphs of even and odd functions. • **PC.2F Graph** exponential, logarithmic, **rational,** polynomial, power, trigonometric, inverse trigonometric, and piecewise-defined functions, including step functions. • **PC.2G 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.** • **PC.2I 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.** • **PC.2J Analyze and describe end behavior of functions**, including exponential, logarithmic, **rational,** polynomial, and power functions, **using infinity notation to communicate this characteristic in mathematical and real-world problems**. • **PC.2K** Analyze characteristics of rational functions and the behavior of the function around the asymptotes, including horizontal, vertical, and oblique asymptotes. • **PC.2L** Determine various types of discontinuities in the interval (-∞, ∞) as they relate to functions and explore the limitations of the graphing calculator as it relates to the behavior of the function around discontinuities.

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Cycle 4	**27 Days** Jan. 19 - Feb. 25, 2022	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
		• **PC.2M** Describe the left-sided behavior and the right-sided behavior of the graph of a function around discontinuities. • **PC.2N Analyze situations modeled by functions**, including exponential, logarithmic, **rational**, polynomial, and power functions, **to solve real-world problems**. **Algebraic Reasoning.** The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms. The student is expected to: • **PC.5L** Solve rational inequalities with real coefficients by applying a variety of techniques and write the solution set of the rational inequality in interval notation in mathematical and real-world problems.
Unit 11: **Exponential and Logarithmic Functions** Students analyze attributes of exponential and logarithmic functions and equations to solve real-world problems.	**4** class periods (90-min. each) or **8** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⑫ **PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace. ⑫ **PC.1B** Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. **Functions.** The student uses process standards in mathematics to explore, describe, and analyze the attributes of functions. The student makes connections between multiple representations of functions and algebraically constructs new functions. The student analyzes and uses functions to model real-world problems. The student is expected to: • **PC.2D** Describe symmetry of graphs of even and odd functions. • **PC.2E** 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. • **PC.2F Graph exponential**, **logarithmic**, rational, polynomial, power, trigonometric, inverse trigonometric, and piecewise-defined functions, including step functions.

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Cycle 4	27 Days	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Jan. 19 - Feb. 25, 2022	

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
		• **PC.2G 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.** • **PC.2I 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.** **Algebraic Reasoning.** The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms. The student is expected to: • **PC.5G** Use the properties of logarithms to evaluate or transform logarithmic expressions. • **PC.5H** Generate and solve logarithmic equations in mathematical and real-world problems. • **PC.5I** Generate and solve exponential equations in mathematical and real-world problems.
Unit 12: Arithmetic and Geometric Sequences and Series Students apply and analyze real-world problems using geometric and arithmetic sequences and series.	**3** class periods (90-min. each) or **6** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⒫ **PC.1B** Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution ⒫ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. **Algebraic Reasoning.** The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms. The student is expected to:

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Cycle 4	27 Days	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete*
	Jan. 19 - Feb. 25, 2022	*instructional planning information and support are in the HISD Curriculum documents.*

Unit	# Class Periods	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
		• **PC.5A** Evaluate finite sums and geometric series, when possible, written in sigma notation. • **PC.5B** Represent arithmetic sequences and geometric sequences using recursive formulas. • **PC.5C** Calculate the nth term and the nth partial sum of an arithmetic series in mathematical and real-world problems. • **PC.5D** Represent arithmetic series and geometric series using sigma notation. • **PC.5E** Calculate the nth term of a geometric series, the nth partial sum of a geometric series, and sum of an infinite geometric series when it exists.

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2021-2022 Scope and Sequence
Mathematics – Precalculus

Cycle 5	33 Days	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Feb. 28 - Apr. 22, 2022	

Unit	# Class Periods	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 13: Binomial Theorem Students use mathematical induction to prove formulas such as the Binomial Theorem.	**2** class periods (90-min. each) or **4** class periods (45-min. each) *Enrichment Opportunities Mar. 14-16* *Spring Break Mar. 14-18* *Chávez-Huerta Day Mar. 28* *Spring Holiday Apr. 15*	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⑱ **PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace. ⑱ **PC.1G** Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication. **Algebraic Reasoning.** The student uses process standards in mathematics to evaluate expressions, describe patterns, formulate models, and solve equations and inequalities using properties, procedures, or algorithms. The student is expected to: • **PC.5F** Apply the Binomial Theorem for the expansion of $(a + b)^n$ in powers of a and b for a positive integer n, where a and b are any numbers.
Unit 14: Conic Sections and Attributes of Ellipses and Hyperbola Students explore and apply properties of conic sections with specific concentration on the properties of an ellipse and hyperbola to write their equations**.**	**5** class periods (90-min. each) or **10** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⑱ **PC.1B** Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. ⑱ **PC.1F** Analyze mathematical relationships to connect and communicate mathematical ideas. **Relations and Geometric Reasoning.** The student uses the process standards in mathematics to model and make connections between algebraic and geometric relations. The student is expected to: • **PC.3F** Determine the conic section formed when a plane intersects a double-napped cone. • **PC.3G** Make connections between the locus definition of conic sections and their equations in rectangular coordinates. • **PC.3H** Use the characteristics of an ellipse to write the equation of an ellipse with center (*h*, *k*). • **PC.3I** Use the characteristics of a hyperbola to write the equation of a hyperbola with center (*h*, *k*).

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Cycle 5	**33 Days** Feb. 28 - Apr. 22, 2022	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 15: Parametric Equations and Plane Curves Students analyze parametric equations in real-world situations.	**3** class periods (90-min. each) or **6** class periods (45 min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⑤ **PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace. ⑤ **PC.1C** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems. **Relations and Geometric Reasoning.** The student uses the process standards in mathematics to model and make connections between algebraic and geometric relations. The student is expected to: • **PC.3A** Graph a set of parametric equations. • **PC.3B** Convert parametric equations into rectangular relations and convert rectangular relations into parametric equations. • **PC.3C** Use parametric equations to model and solve mathematical and real-world problems.
Unit 16: Polar Coordinates, Equations, and Graphs Students explore the properties and relationships of the polar coordinate system and the Cartesian coordinate system. They represent complex numbers in polar form and use polar coordinates to graph and apply functions in real-world situations. (continues in cycle 6)	**5** class periods (90-min. each) or **10** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⑤ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. ⑤ **PC.1E** Create and use representations to organize, record, and communicate mathematical ideas. **Relations and Geometric Reasoning.** The student uses the process standards in mathematics to model and make connections between algebraic and geometric relations. The student is expected to: • **PC.3D** Graph points in the polar coordinate system and convert between rectangular coordinates and polar coordinates. • **PC.3E** Graph polar equations by plotting points and using technology.

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Cycle 6	**31 Days**	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
	Apr. 25 - June 7, 2022	

Unit	# Class Periods	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 16: Polar Coordinates, Equations, and Graphs Students explore the properties and relationships of the polar coordinate system and the Cartesian coordinate system. They represent complex numbers in polar form and use polar coordinates to graph and apply functions in real-world situations. (continued from cycle 5)	**5** class periods (90-min. each) or **10** class periods (45-min. each) *Memorial Day May 30* *Teacher Prep Day (no students) June 8*	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. ⓅⓈ **PC.1E** Create and use representations to organize, record, and communicate mathematical ideas. **Relations and Geometric Reasoning.** The student uses the process standards in mathematics to model and make connections between algebraic and geometric relations. The student is expected to: • **PC.3D** Graph points in the polar coordinate system and convert between rectangular coordinates and polar coordinates. **PC.3E** Graph polar equations by plotting points and using technology.
Unit 17: Vectors Students explore two- and three-dimensional applications of vectors through dot products and cross products.	**4** class periods (90-min. each) or **8** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1A** Apply mathematics to problem arising in everyday life, society, and the workplace. ⓅⓈ **PC.1C** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems. **Number and Measure.** The student uses process standards in mathematics to apply appropriate techniques, tools, and formulas to calculate measures in mathematical and real-world problems. The student is expected to: • **PC.4I** Use vectors to model situations defined by magnitude and direction. • **PC4J** Represent the addition of vectors and the multiplication of a vector by a scalar geometrically and symbolically. • **PC.4K** Apply vector addition and multiplication of a vector by a scalar in mathematical and real-world problems.

Cycle 6	31 Days	The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.
	Apr. 25 - June 7, 2022	

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)
		The **bold face** words in the TEKS/SEs indicate concepts addressed specifically in this unit; the unbolded concepts are addressed in other units of this course.
		The student will:
Unit 18: Bridge to Calculus: Exploring Limits Students are introduced to concept of limits in data and real-world situations.	**3** class periods (90-min. each) or **6** class periods (45-min. each)	**Mathematical Process Standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: ⓅⓈ **PC.1F** Analyze mathematical relationships to connect and communicate mathematical ideas. ⓅⓈ **PC.1G** Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication. **College Board Learning Objectives for AP Calculus.** • **CHA-2.A Determine average rates of change** using difference quotients. • **LIM-1.C** Estimate Limits of functions. • **LIM-1.E The limits of functions using equivalent expressions for the function** or the squeeze theorem. • **LIM-2.A** Justify conclusions about continuity at a point using the definition. • **LIM-2.D** Interpret the behavior of functions using limits involving infinity. • **FUN-3.A.3 The power rule** combined with sum, difference, and constant multiple properties **can be used to find the derivatives for polynomial functions.**

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