

Tick one box per statement: ☐ not yet ☐ nearly ☐ confident. / /

1. Polynomial and Rational Functions

1.1 Change in Tandem

- ☐☐☐ Describe how the input and output values of a function vary together by comparing function values.
- ☐☐☐ Construct a graph representing two quantities that vary with respect to each other in a contextual scenario.

1.2 Rates of Change

- ☐☐☐ Compare the rates of change at two points using average rates of change near the points.
- ☐☐☐ Describe how two quantities vary together at different points and over different intervals of a function.

1.3 Rates of Change in Linear and Quadratic Functions

- ☐☐☐ Determine the average rates of change for sequences and functions, including linear, quadratic, and other function types.
- ☐☐☐ Determine the change in the average rates of change for linear, quadratic, and other function types.

1.4 Polynomial Functions and Rates of Change

- ☐☐☐ Identify key characteristics of polynomial functions related to rates of change.

1.5 Polynomial Functions and Complex Zeros

- ☐☐☐ Identify key characteristics of a polynomial function related to its zeros when suitable factorizations are available or with technology.
- ☐☐☐ Determine if a polynomial function is even or odd.

1.6 Polynomial Functions and End Behavior

- ☐☐☐ Describe end behaviors of polynomial functions.

1.7 Rational Functions and End Behavior

- ☐☐☐ Describe end behaviors of rational functions.

1.8 Rational Functions and Zeros

- ☐☐☐ Determine the zeros of rational functions.

1.9 Rational Functions and Vertical Asymptotes

- ☐☐☐ Determine vertical asymptotes of graphs of rational functions.

1.10 Rational Functions and Holes

- ☐☐☐ Determine holes in graphs of rational functions.

1.11 Equivalent Representations of Polynomial and Rational Expressions

- ☐☐☐ Rewrite polynomial and rational expressions in equivalent forms.
- ☐☐☐ Determine the quotient of two polynomial functions using long division.
- ☐☐☐ Rewrite the repeated product of binomials using the binomial theorem.

1.12 Transformations of Functions

- ☐☐☐ Construct a function that is an additive and/or multiplicative transformation of another function.

1.13 Function Model Selection and Assumption Articulation

- ☐☐☐ Identify an appropriate function type to construct a function model for a given scenario.
- ☐☐☐ Describe assumptions and restrictions related to building a function model.

1.14 Function Model Construction and Application

- ☐☐☐ Construct a linear, quadratic, cubic, quartic, polynomial of degree n , or related piecewise-defined function model.
- ☐☐☐ Construct a rational function model based on a context.
- ☐☐☐ Apply a function model to answer questions about a data set or contextual scenario.

2. Exponential and Logarithmic Functions

2.1 Change in Arithmetic and Geometric Sequences

- ☐☐☐ Express arithmetic sequences found in mathematical and contextual scenarios as functions of the whole numbers.
- ☐☐☐ Express geometric sequences found in mathematical and contextual scenarios as functions of the whole numbers.

2.2 Change in Linear and Exponential Functions

- ☐☐☐ Construct functions of the real numbers that are comparable to arithmetic and geometric sequences.

2.3 Exponential Functions

- ☐☐☐ Identify key characteristics of exponential functions.

2.4 Exponential Function Manipulation

- ☐☐☐ Rewrite exponential expressions in equivalent forms.

2.5 Exponential Function Context and Data Modeling

- ☐☐☐ Construct a model for situations involving proportional output values over equal-length input-value intervals.

2.6 Competing Function Model Validation

- ☐☐☐ Construct linear, quadratic, and exponential models based on a data set.
- ☐☐☐ Validate a model constructed from a data set.

2.7 Composition of Functions

- ☐☐☐ Evaluate the composition of two or more functions for given values.
- ☐☐☐ Construct a representation of the composition of two or more functions.
- ☐☐☐ Rewrite a given function as a composition of two or more functions.

2.8 Inverse Functions

- ☐☐☐ Determine the input-output pairs of the inverse of a function.
- ☐☐☐ Determine the inverse of a function on an invertible domain.

2.9 Logarithmic Expressions

- ☐☐☐ Evaluate logarithmic expressions.

2.10 Inverses of Exponential Functions

- ☐☐☐ Construct representations of the inverse of an exponential function with an initial value of 1.

2.11 Logarithmic Functions

- ☐☐☐ Identify key characteristics of logarithmic functions.

2.12 Logarithmic Function Manipulation

- ☐☐☐ Rewrite logarithmic expressions in equivalent forms.

2.13 Exponential and Logarithmic Equations and Inequalities

- ☐☐☐ Solve exponential and logarithmic equations and inequalities.
- ☐☐☐ Construct the inverse function for exponential and logarithmic functions.

2.14 Logarithmic Function Context and Data Modeling

- ☐☐☐ Construct a logarithmic function model.

2.15 Semi-log Plots

- ☐☐☐ Determine if an exponential model is appropriate by examining a semi-log plot of a data set.
- ☐☐☐ Construct the linearization of exponential data.

3. Trigonometric and Polar Functions

3.1 Periodic Phenomena

- ☐☐☐ Construct graphs of periodic relationships based on verbal representations.
- ☐☐☐ Describe key characteristics of a periodic function based on a verbal representation.

3.2 Sine, Cosine, and Tangent

- ☐☐☐ Determine the sine, cosine, and tangent of an angle using the unit circle.

3.3 Sine and Cosine Function Values

- ☐☐☐ Determine coordinates of points on a circle centered at the origin.

3.4 Sine and Cosine Function Graphs

- ☐☐☐ Construct representations of the sine and cosine functions using the unit circle.

3.5 Sinusoidal Functions

- ☐☐☐ Identify key characteristics of the sine and cosine functions.

3.6 Sinusoidal Function Transformations

- ☐☐☐ Identify the amplitude, vertical shift, period, and phase shift of a sinusoidal function.

3.7 Sinusoidal Function Context and Data Modeling

- ☐☐☐ Construct sinusoidal function models of periodic phenomena.

3.8 The Tangent Function

- ☐☐☐ Construct representations of the tangent function using the unit circle.
- ☐☐☐ Describe key characteristics of the tangent function.

3.9 Inverse Trigonometric Functions

- ☐☐☐ Construct analytical and graphical representations of the inverse of the sine, cosine, and tangent functions over a restricted domain.

3.10 Trigonometric Equations and Inequalities

- ☐☐☐ Solve equations and inequalities involving trigonometric functions.

3.11 The Secant, Cosecant, and Cotangent Functions

- ☐☐☐ Identify key characteristics of functions that involve quotients of the sine and cosine functions.

3.12 Equivalent Representations of Trigonometric Functions

- ☐☐☐ Rewrite trigonometric expressions in equivalent forms with the Pythagorean identity.
- ☐☐☐ Rewrite trigonometric expressions in equivalent forms with sine and cosine sum identities.
- ☐☐☐ Solve equations using equivalent analytic representations of trigonometric functions.

3.13 Trigonometry and Polar Coordinates

- ☐☐☐ Determine the location of a point in the plane using both rectangular and polar coordinates.

3.14 Polar Function Graphs

- ☐☐☐ Construct graphs of polar functions.

3.15 Rates of Change in Polar Functions

- ☐☐☐ Describe characteristics of the graph of a polar function.

4. Functions Involving Parameters, Vectors, and Matrices

4.1 Parametric Functions

- ☐☐☐ Construct a graph or table of values for a parametric function represented analytically.

4.2 Parametric Functions Modeling Planar Motion

- ☐☐☐ Identify key characteristics of a parametric planar motion function that are related to position.

4.3 Parametric Functions and Rates of Change

- ☐☐☐ Identify key characteristics of a parametric planar motion function that are related to direction and rate of change.

4.4 Parametrically Defined Circles and Lines

- ☐☐☐ Express motion around a circle or along a line segment parametrically.

4.5 Implicitly Defined Functions

- ☐☐☐ Construct a graph of an equation involving two variables.
- ☐☐☐ Determine how the two quantities related in an implicitly defined function vary together.

4.6 Conic Sections

- ☐☐☐ Represent conic sections with horizontal or vertical symmetry analytically.

4.7 Parametrization of Implicitly Defined Functions

- ☐☐☐ Represent a curve in the plane parametrically.
- ☐☐☐ Represent conic sections parametrically.

4.8 Vectors

- ☐☐☐ Identify characteristics of a vector.
- ☐☐☐ Determine sums and products involving vectors.
- ☐☐☐ Determine a unit vector for a given vector.
- ☐☐☐ Determine angle measures between vectors and magnitudes of vectors involved in vector addition.

4.9 Vector-Valued Functions

- ☐☐☐ Represent planar motion in terms of vector-valued functions.

4.10 Matrices

- ☐☐☐ Determine the product of two matrices.

4.11 The Inverse and Determinant of a Matrix

- ☐☐☐ Determine the inverse of a 2×2 matrix.
- ☐☐☐ Apply the value of the determinant to invertibility and vectors.

4.12 Linear Transformations and Matrices

☐☐☐ Determine the output vectors of a linear transformation using a 2×2 matrix.

4.13 Matrices as Functions

☐☐☐ Determine the association between a linear transformation and a matrix.

☐☐☐ Determine the composition of two linear transformations.

☐☐☐ Determine the inverse of a linear transformation.

4.14 Matrices Modeling Contexts

☐☐☐ Construct a model of a scenario involving transitions between two states using matrices.

☐☐☐ Apply matrix models to predict future and past states for n transition steps.