AP Precalculus

Syllabus Checklist · 大纲自查表

Tick one box per statement: ☐ not yet ☐ nearly ☐ confident. 每条打一个勾：尚未掌握 / 快会了 / 有把握。

1. Polynomial and Rational Functions 多项式函数与有理函数

1.1 Change in Tandem 协同变化

- ☐☐☐ 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 变化率

- ☐☐☐ 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 线性函数与二次函数的变化率

- ☐☐☐ 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 多项式函数与变化率

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

1.5 Polynomial Functions and Complex Zeros 多项式函数与复数零点

- ☐☐☐ 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 多项式函数与末端行为

- ☐☐☐ Describe end behaviors of polynomial functions.

1.7 Rational Functions and End Behavior 有理函数与末端行为

- ☐☐☐ Describe end behaviors of rational functions.

1.8 Rational Functions and Zeros 有理函数与零点

- ☐☐☐ Determine the zeros of rational functions.

1.9 Rational Functions and Vertical Asymptotes 有理函数与竖直渐近线

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

1.10 Rational Functions and Holes 有理函数与空洞

☐☐☐ Determine holes in graphs of rational functions.

1.11 Equivalent Representations of Polynomial and Rational Expressions 多项式与有理表达式的等价表示

☐☐☐ 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 函数的变换

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

1.13 Function Model Selection and Assumption Articulation 函数模型选择与假设阐述

☐☐☐ 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 函数模型的构建与应用

☐☐☐ 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 指数函数与对数函数

2.1 Change in Arithmetic and Geometric Sequences 等差数列与等比数列的变化

☐☐☐ 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 线性函数与指数函数的变化

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

2.3 Exponential Functions 指数函数

☐☐☐ Identify key characteristics of exponential functions.

2.4 Exponential Function Manipulation 指数函数的运算

☐☐☐ Rewrite exponential expressions in equivalent forms.

2.5 Exponential Function Context and Data Modeling 指数函数的情境与数据建模

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

2.6 Competing Function Model Validation 竞争函数模型的验证

☐☐☐ Construct linear, quadratic, and exponential models based on a data set.

☐☐☐ Validate a model constructed from a data set.

2.7 Composition of Functions 复合函数

☐☐☐ 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 反函数

☐☐☐ 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 对数表达式

☐☐☐ Evaluate logarithmic expressions.

2.10 Inverses of Exponential Functions 指数函数的反函数

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

2.11 Logarithmic Functions 对数函数

☐☐☐ Identify key characteristics of logarithmic functions.

2.12 Logarithmic Function Manipulation 对数函数的运算

☐☐☐ Rewrite logarithmic expressions in equivalent forms.

2.13 Exponential and Logarithmic Equations and Inequalities 指数与对数方程和不等式

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

2.14 Logarithmic Function Context and Data Modeling 对数函数的情境与数据建模

☐☐☐ Construct a logarithmic function model.

2.15 Semi-log Plots 半对数图

☐☐☐ 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 三角函数与极坐标函数

3.1 Periodic Phenomena 周期现象

☐☐☐ 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 正弦、余弦与正切

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

3.3 Sine and Cosine Function Values 正弦与余弦函数值

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

3.4 Sine and Cosine Function Graphs 正弦与余弦函数图像

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

3.5 Sinusoidal Functions 正弦型函数

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

3.6 Sinusoidal Function Transformations 正弦型函数的变换

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

3.7 Sinusoidal Function Context and Data Modeling 正弦型函数的情境与数据建模

☐☐☐ Construct sinusoidal function models of periodic phenomena.

3.8 The Tangent Function 正切函数

☐☐☐ Construct representations of the tangent function using the unit circle.

☐☐☐ Describe key characteristics of the tangent function.

3.9 Inverse Trigonometric Functions 反三角函数

☐☐☐ 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 三角方程与不等式

☐☐☐ Solve equations and inequalities involving trigonometric functions.

3.11 The Secant, Cosecant, and Cotangent Functions 正割、余割与余切函数

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

3.12 Equivalent Representations of Trigonometric Functions 三角函数的等价表示

☐☐☐ 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 三角学与极坐标

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

3.14 Polar Function Graphs 极坐标函数图像

☐☐☐ Construct graphs of polar functions.

3.15 Rates of Change in Polar Functions 极坐标函数的变化率

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

4. Functions Involving Parameters, Vectors, and Matrices

涉及参数、向量与矩阵的函数

4.1 Parametric Functions 参数方程函数

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

4.2 Parametric Functions Modeling Planar Motion 用参数方程函数为平面运动建模

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

4.3 Parametric Functions and Rates of Change 参数方程函数与变化率

☐☐☐ 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 参数定义的圆与直线

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

4.5 Implicitly Defined Functions 隐函数

☐☐☐ 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 圆锥曲线

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

4.7 Parametrization of Implicitly Defined Functions 隐函数的参数化

☐☐☐ Represent a curve in the plane parametrically.

☐☐☐ Represent conic sections parametrically.

4.8 Vectors 向量

☐☐☐ 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 向量值函数

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

4.10 Matrices 矩阵

☐☐☐ Determine the product of two matrices.

4.11 The Inverse and Determinant of a Matrix 矩阵的逆与行列式

☐☐☐ Determine the inverse of a 2×2 matrix.

☐☐☐ Apply the value of the determinant to invertibility and vectors.

4.12 Linear Transformations and Matrices 线性变换与矩阵

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

4.13 Matrices as Functions 作为函数的矩阵

☐☐☐ 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 用矩阵为情境建模

☐☐☐ 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.