

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

1. Limits and Continuity

1.1 Introducing Calculus: Can Change Occur at an Instant?

- ☐☐☐
- Interpret the rate of change at an instant in terms of average rates of change over intervals containing that instant.

1.2 Defining Limits and Using Limit Notation

- ☐☐☐
- Represent limits analytically using correct notation.
- ☐☐☐
- Interpret limits expressed in analytic notation.

1.3 Estimating Limit Values from Graphs

- ☐☐☐
- Estimate limits of functions.

1.4 Estimating Limit Values from Tables

- ☐☐☐
- Estimate limits of functions.

1.5 Determining Limits Using Algebraic Properties of Limits

- ☐☐☐
- Determine the limits of functions using limit theorems.

1.6 Determining Limits Using Algebraic Manipulation

- ☐☐☐
- Determine the limits of functions using equivalent expressions for the function or the squeeze theorem.

1.7 Selecting Procedures for Determining Limits

- ☐☐☐
- Selecting Procedures for Determining Limits

1.8 Determining Limits Using the Squeeze Theorem

- ☐☐☐
- Determine the limits of functions using equivalent expressions for the function or the squeeze theorem.

1.9 Connecting Multiple Representations of Limits

- ☐☐☐
- Connecting Multiple Representations of Limits

1.10 Exploring Types of Discontinuities

- ☐☐☐
- Justify conclusions about continuity at a point using the definition.

1.11 Defining Continuity at a Point

- ☐☐☐
- Justify conclusions about continuity at a point using the definition.

1.12 Confirming Continuity over an Interval

- ☐☐☐
- Determine intervals over which a function is continuous.

1.13 Removing Discontinuities

- ☐☐☐
- Determine values of
- x
- or solve for parameters that make discontinuous functions continuous, if possible.

1.14 Connecting Infinite Limits and Vertical Asymptotes

- ☐☐☐
- Interpret the behavior of functions using limits involving infinity.

1.15 Connecting Limits at Infinity and Horizontal Asymptotes

- ☐☐☐
- Interpret the behavior of functions using limits involving infinity.

1.16 Working with the Intermediate Value Theorem (IVT) (IVT)

- ☐☐☐
- Explain the behavior of a function on an interval using the Intermediate Value Theorem.

2. Differentiation: Definition and Fundamental Properties

2.1 Defining Average and Instantaneous Rates of Change at a Point

- ☐☐☐
- Determine average rates of change using difference quotients.
- ☐☐☐
- Represent the derivative of a function as the limit of a difference quotient.

2.2 Defining the Derivative of a Function and Using Derivative Notation

- ☐☐☐
- Represent the derivative of a function as the limit of a difference quotient.
- ☐☐☐
- Determine the equation of a line tangent to a curve at a given point.

2.3 Estimating Derivatives of a Function at a Point

- ☐☐☐
- Estimate derivatives.

2.4 Connecting Differentiability and Continuity: Determining When Derivatives Do and Do Not Exist

- ☐☐☐
- Explain the relationship between differentiability and continuity.

2.5 Applying the Power Rule

- ☐☐☐
- Calculate derivatives of familiar functions.

2.6 Derivative Rules: Constant, Sum, Difference, and Constant Multiple

- ☐☐☐
- Calculate derivatives of familiar functions.

2.7 Derivatives of $\cos x$, $\sin x$, e^x , and $\ln x$ $\cos x$, $\sin x$, e^x , $\ln x$

- ☐☐☐
- Calculate derivatives of familiar functions.
- ☐☐☐
- Interpret a limit as a definition of a derivative.

2.8 The Product Rule

- ☐☐☐ Calculate derivatives of products and quotients of differentiable functions.

2.9 The Quotient Rule

- ☐☐☐ Calculate derivatives of products and quotients of differentiable functions.

2.10 Finding the Derivatives of Tangent, Cotangent, Secant, and/or Cosecant Functions

- ☐☐☐ Calculate derivatives of products and quotients of differentiable functions.

3. Differentiation: Composite, Implicit, and Inverse Functions

3.1 The Chain Rule

- ☐☐☐ Calculate derivatives of compositions of differentiable functions.

3.2 Implicit Differentiation

- ☐☐☐ Calculate derivatives of implicitly defined functions.

3.3 Differentiating Inverse Functions

- ☐☐☐ Calculate derivatives of inverse and inverse trigonometric functions.

3.4 Differentiating Inverse Trigonometric Functions

- ☐☐☐ Calculate derivatives of inverse and inverse trigonometric functions.

3.5 Selecting Procedures for Calculating Derivatives

- ☐☐☐ Selecting Procedures for Calculating Derivatives

3.6 Calculating Higher-Order Derivatives

- ☐☐☐ Determine higher order derivatives of a function.

4. Contextual Applications of Differentiation

4.1 Interpreting the Meaning of the Derivative in Context

- ☐☐☐ Interpret the meaning of a derivative in context.

4.2 Straight-Line Motion: Connecting Position, Velocity, and Acceleration

- ☐☐☐ Calculate rates of change in applied contexts.

4.3 Rates of Change in Applied Contexts Other Than Motion

- ☐☐☐ Interpret rates of change in applied contexts.

4.4 Introduction to Related Rates

- ☐☐☐ Calculate related rates in applied contexts.

4.5 Solving Related Rates Problems

- ☐☐☐ Interpret related rates in applied contexts.

4.6 Approximating Values of a Function Using Local Linearity and Linearization

- ☐☐☐ Approximate a value on a curve using the equation of a tangent line.

4.7 Using L'Hospital's Rule for Determining Limits of Indeterminate Forms

- ☐☐☐ Determine limits of functions that result in indeterminate forms.

5. Analytical Applications of Differentiation

5.1 Using the Mean Value Theorem

- ☐☐☐ Justify conclusions about functions by applying the Mean Value Theorem over an interval.

5.2 Extreme Value Theorem, Global Versus Local Extrema, and Critical Points

- ☐☐☐ Justify conclusions about functions by applying the Extreme Value Theorem.

5.3 Determining Intervals on Which a Function Is Increasing or Decreasing

- ☐☐☐ Justify conclusions about the behavior of a function based on the behavior of its derivatives.

5.4 Using the First Derivative Test to Determine Relative (Local) Extrema ()

- ☐☐☐ Justify conclusions about the behavior of a function based on the behavior of its derivatives.

5.5 Using the Candidates Test to Determine Absolute (Global) Extrema ()

- ☐☐☐ Justify conclusions about the behavior of a function based on the behavior of its derivatives.

5.6 Determining Concavity of Functions over Their Domains

- ☐☐☐ Justify conclusions about the behavior of a function based on the behavior of its derivatives.

5.7 Using the Second Derivative Test to Determine Extrema

- ☐☐☐ Justify conclusions about the behavior of a function based on the behavior of its derivatives.

5.8 Sketching Graphs of Functions and Their Derivatives

- ☐☐☐ Justify conclusions about the behavior of a function based on the behavior of its derivatives.

5.9 Connecting a Function, Its First Derivative, and Its Second Derivative

- ☐☐☐ Justify conclusions about the behavior of a function based on the behavior of its derivatives.

5.10 Introduction to Optimization Problems

- ☐☐☐ Calculate minimum and maximum values in applied contexts or analysis of functions.

5.11 Solving Optimization Problems

- ☐☐☐ Interpret minimum and maximum values calculated in applied contexts.

5.12 Exploring Behaviors of Implicit Relations

- ☐☐☐ Determine critical points of implicit relations.
- ☐☐☐ Justify conclusions about the behavior of an implicitly defined function based on evidence from its derivatives.

6. Integration and Accumulation of Change

6.1 Exploring Accumulations of Change

- ☐☐☐ Interpret the meaning of areas associated with the graph of a rate of change in context.

6.2 Approximating Areas with Riemann Sums

- ☐☐☐ Approximate a definite integral using geometric and numerical methods.

6.3 Riemann Sums, Summation Notation, and Definite Integral Notation

- ☐☐☐ Interpret the limiting case of the Riemann sum as a definite integral.
- ☐☐☐ Represent the limiting case of the Riemann sum as a definite integral.

6.4 The Fundamental Theorem of Calculus and Accumulation Functions

- ☐☐☐ Represent accumulation functions using definite integrals.

6.5 Interpreting the Behavior of Accumulation Functions Involving Area

- ☐☐☐ Represent accumulation functions using definite integrals.

6.6 Applying Properties of Definite Integrals

- ☐☐☐ Calculate a definite integral using areas and properties of definite integrals.

6.7 The Fundamental Theorem of Calculus and Definite Integrals

- ☐☐☐ Evaluate definite integrals analytically using the Fundamental Theorem of Calculus.

6.8 Finding Antiderivatives and Indefinite Integrals: Basic Rules and Notation

- ☐☐☐ Determine antiderivatives of functions and indefinite integrals, using knowledge of derivatives.

6.9 Integrating Using Substitution

- ☐☐☐ For integrands requiring substitution or rearrangements into equivalent forms:

6.10 Integrating Functions Using Long Division and Completing the Square

- ☐☐☐ For integrands requiring substitution or rearrangements into equivalent forms:

6.11 Integrating Using Integration by Parts

- ☐☐☐ For integrands requiring integration by parts:

6.12 Integrating Using Linear Partial Fractions

- ☐☐☐ For integrands requiring integration by linear partial fractions:

6.13 Evaluating Improper Integrals

- ☐☐☐ Evaluate an improper integral or determine that the integral diverges. **BC ONLY**

6.14 Selecting Techniques for Antidifferentiation

- ☐☐☐ Selecting Techniques for Antidifferentiation

7. Differential Equations

7.1 Modeling Situations with Differential Equations

- ☐☐☐ Interpret verbal statements of problems as differential equations involving a derivative expression.

7.2 Verifying Solutions for Differential Equations

- ☐☐☐ Verify solutions to differential equations.

7.3 Sketching Slope Fields

- ☐☐☐ Estimate solutions to differential equations.

7.4 Reasoning Using Slope Fields

- ☐☐☐ Estimate solutions to differential equations.

7.5 Approximating Solutions Using Euler’s Method

- ☐☐☐ Estimate solutions to differential equations.

7.6 Finding General Solutions Using Separation of Variables

- ☐☐☐ Determine general solutions to differential equations.

7.7 Finding Particular Solutions Using Initial Conditions and Separation of Variables

- ☐☐☐ Determine particular solutions to differential equations.

7.8 Exponential Models with Differential Equations

- ☐☐☐ Interpret the meaning of a differential equation and its variables in context.
- ☐☐☐ Determine general and particular solutions for problems involving differential equations in context.

7.9 Logistic Models with Differential Equations

- ☐☐☐ Interpret the meaning of the logistic growth model in context. **BC ONLY**

8. Applications of Integration

8.1 Finding the Average Value of a Function on an Interval

- ☐☐☐ Determine the average value of a function using definite integrals.

8.2 Connecting Position, Velocity, and Acceleration of Functions Using Integrals

- ☐☐☐ Determine values for positions and rates of change using definite integrals in problems involving rectilinear motion.

8.3 Using Accumulation Functions and Definite Integrals in Applied Contexts

- ☐☐☐ Interpret the meaning of a definite integral in accumulation problems.
- ☐☐☐ Determine net change using definite integrals in applied contexts.

8.4 Finding the Area Between Curves Expressed as Functions of x

- ☐☐☐ Calculate areas in the plane using the definite integral.

8.5 Finding the Area Between Curves Expressed as Functions of y

- ☐☐☐ Calculate areas in the plane using the definite integral.

8.6 Finding the Area Between Curves That Intersect at More Than Two Points

- ☐☐☐ Calculate areas in the plane using the definite integral.

8.7 Volumes with Cross Sections: Squares and Rectangles

- ☐☐☐ Calculate volumes of solids with known cross sections using definite integrals.

8.8 Volumes with Cross Sections: Triangles and Semicircles

- ☐☐☐ Calculate volumes of solids with known cross sections using definite integrals.

8.9 Volume with Disc Method: Revolving Around the x - or y -Axis

- ☐☐☐ Calculate volumes of solids of revolution using definite integrals.

8.10 Volume with Disc Method: Revolving Around Other Axes

- ☐☐☐ Calculate volumes of solids of revolution using definite integrals.

8.11 Volume with Washer Method: Revolving Around the x - or y -Axis

- ☐☐☐ Calculate volumes of solids of revolution using definite integrals.

8.12 Volume with Washer Method: Revolving Around Other Axes

- ☐☐☐ Calculate volumes of solids of revolution using definite integrals.

8.13 The Arc Length of a Smooth, Planar Curve and Distance Traveled

- ☐☐☐ Determine the length of a curve in the plane defined by a function, using a definite integral. **BC ONLY**

9. Parametric Equations, Polar Coordinates, and Vector-Valued Functions

9.1 Defining and Differentiating Parametric Equations

- ☐☐☐ Calculate derivatives of parametric functions. **BC ONLY**

9.2 Second Derivatives of Parametric Equations

- ☐☐☐ Calculate derivatives of parametric functions. **BC ONLY**

9.3 Finding Arc Lengths of Curves Given by Parametric Equations

- ☐☐☐ Determine the length of a curve in the plane defined by parametric functions, using a definite integral. **BC ONLY**

9.4 Defining and Differentiating Vector-Valued Functions

- ☐☐☐ Calculate derivatives of vector-valued functions. **BC ONLY**

9.5 Integrating Vector-Valued Functions

- ☐☐☐ Determine a particular solution given a rate vector and initial conditions. **BC ONLY**

9.6 Solving Motion Problems Using Parametric and Vector-Valued Functions

- ☐☐☐ Determine values for positions and rates of change in problems involving planar motion. **BC ONLY**

9.7 Defining Polar Coordinates and Differentiating in Polar Form

- ☐☐☐ Calculate derivatives of functions written in polar coordinates. **BC ONLY**

9.8 Find the Area of a Polar Region or the Area Bounded by a Single Polar Curve

- ☐☐☐ Calculate areas of regions defined by polar curves using definite integrals. **BC ONLY**

9.9 Finding the Area of the Region Bounded by Two Polar Curves

- ☐☐☐ Calculate areas of regions defined by polar curves using definite integrals. **BC ONLY**

10. Infinite Sequences and Series

10.1 Defining Convergent and Divergent Infinite Series

- ☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.2 Working with Geometric Series

- ☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.3 The n th Term Test for Divergence

- ☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.4 Integral Test for Convergence

- ☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.5 Harmonic Series and p -Series

- ☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.6 Comparison Tests for Convergence

☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.7 Alternating Series Test for Convergence

☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.8 Ratio Test for Convergence

☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.9 Determining Absolute or Conditional Convergence

☐☐☐ Determine whether a series converges or diverges. **BC ONLY**

10.10 Alternating Series Error Bound

☐☐☐ Approximate the sum of a series. **BC ONLY**

10.11 Finding Taylor Polynomial Approximations of Functions

☐☐☐ Represent a function at a point as a Taylor polynomial. **BC ONLY**

☐☐☐ Approximate function values using a Taylor polynomial. **BC ONLY**

10.12 Lagrange Error Bound

☐☐☐ Determine the error bound associated with a Taylor polynomial approximation. **BC ONLY**

10.13 Radius and Interval of Convergence of Power Series

☐☐☐ Determine the radius of convergence and interval of convergence for a power series. **BC ONLY**

10.14 Finding Taylor or Maclaurin Series for a Function

☐☐☐ Represent a function as a Taylor series or a Maclaurin series. **BC ONLY**

☐☐☐ Interpret Taylor series and Maclaurin series. **BC ONLY**

10.15 Representing Functions as Power Series

☐☐☐ Represent a given function as a power series. **BC ONLY**