

*Calculus A Targets (to be learned prior to start of Calculus BC)*

**UNIT 1 : Functions, Graphs, and Limits**

- Target 1A: Find the limits of functions graphically, numerically, and analytically
- Target 1B: Understand the continuity of a function
- Target 1C: Discuss one-sided limits
- Target 1D: Use limits to find limits at infinity and infinite limits
- Target 1E: Analyze planar curves including parametric, polar, and vector form.

*Calculus BC Targets – Semester 1*

**UNIT 2: Differentiation**

- Target 2A: Use and apply the definition of the derivative
- Target 2B: Understand basic rules of differentiation, including trig, logarithmic, exponential, parametric, polar, and vector functions
- Target 2C: Apply the product, quotient, and chain rules to differentiate functions
- Target 2D: Make connections between position, velocity, and acceleration
- Target 2E: Understand the difference between instantaneous and average rate of change
- Target 2F: Analyze planar curves in parametric, polar, and vector form, including velocity and acceleration
- Target 2G: Apply rules of differentiation to implicit equations.

**UNIT 3: Applications of Derivatives**

- Target 3A: Understand the Extreme and Mean Value Theorems
- Target 3B: Determine extrema and increasing/decreasing behavior of a function
- Target 3C: Use the 2<sup>nd</sup> derivative test to determine extrema
- Target 3D: Use the 2<sup>nd</sup> derivative to determine concavity
- Target 3E: Solve optimization problems
- Target 3F: Calculate linear approximations
- Target 3G: Solve related rate problems

**UNIT 4: Definite Integrals**

- Target 4A: Calculate areas using the rectangular approximation methods.
- Target 4B: Use Riemann Sums with uneven subintervals.
- Target 4C: Use the definite integral as a limit of Riemann Sums.
- Target 4D: Use technology to calculate the definite integral.
- Target 4E: Understand the Mean Value Theorem for Integrals and Average Value Theorem
- Target 4F: Understand basic rules of antidifferentiation, including trig, logarithmic, exponential, parametric, polar, and vector functions
- Target 4G: Apply the technique of substitution, integration by parts, and partial fractions to antidifferentiate functions
- Target 4H: Use the Fundamental Theorem of Calculus to find the derivative of an integral
- Target 4I: Use the definite integral as a limit of Trapezoid Sums

**Unit 5: Differential Equations & Mathematical Modeling**

- Target 5A: Construct and analyze slope fields
- Target 5B: Determine numerical solutions of differential equations using Euler's method
- Target 5C: Solve separable and logistic differential equations
- Target 5D: Apply differential equations to real-life problems

*Calculus BC Targets – Semester 2*

**Unit 6: Applications of Definite Integrals**

- Target 6A: Determine the area between curves and the area enclosed by intersecting curves with respect to  $x$
- Target 6B: Determine the area between curves and the area enclosed by intersecting curves with respect to  $y$
- Target 6C: Determine the area bounded by polar curves
- Target 6D: Calculate the volume of a solid using Disk and Washer Method
- Target 6E: Calculate the volume of a solid using Cross Sections
- Target 6F: Find the length of a curve, including a curve given in parametric form

**Unit 7: L'Hôpital's Rule and Improper Integrals**

- Target 7A: Apply L'Hôpital's Rule, including its use in determining limits and convergence of improper integrals and series
- Target 7B: Apply the technique of improper integrals as limits of definite integrals

**Unit 8: Infinite Series**

- Target 8A: Understand the concept of series as a sequence of partial sums as converging or diverging with motivating examples
- Target 8B: Understand the convergence of geometric, harmonic, and alternating series
- Target 8C: Determine appropriate tests for convergence, including ratio,  $n^{\text{th}}$  term, integral, and comparison tests
- Target 8D: Use Taylor polynomial approximation with graphical demonstration of convergence
- Target 8E: Manipulate Taylor series centered at  $x = a$  including substitution, differentiation, antidifferentiation, and the formation of new series from known series
- Target 8F: Identify and use the Maclaurin series centered at  $x = a$  for the functions  $e^x$ ,  $\sin x$ ,  $\cos x$ , and  $1/(1-x)$
- Target 8F: Determine radius and interval of convergence of power series
- Target 8G: Use Lagrange error bound for Taylor polynomials

**Semester 2 Ends**