



Dr. Bryan Long

Math and Physics Teacher / Tutor

www.longevitylearninglab.org

717-471-6445

Lancaster, PA

Below is a list of topics for a general High School Calculus Class. Dr. Long can teach any of these topics and/or provide homework help. Dr. Long believes all math is a skill that needs consistent practice to master.

Calculus Topics:

1. Limits and Continuity:

- Understanding limits conceptually and computationally
- Finding limits algebraically, graphically, and using L'Hôpital's Rule
- Continuity of functions
- Intermediate Value Theorem

2. Differentiation:

- Definition of the derivative
- Derivative rules (power rule, product rule, quotient rule, chain rule)
- Implicit differentiation
- Higher-order derivatives
- Applications of derivatives (related rates, optimization, curve sketching)

3. Applications of Differentiation:

- Finding local and absolute extrema
- Using the first and second derivative tests
- Concavity and points of inflection
- Curve sketching
- Optimization problems
- Related rates problems

4. Integration and Antiderivatives:

- Indefinite integrals and antiderivatives
- Integration techniques (substitution, integration by parts, partial fractions)
- Definite integrals and the Fundamental Theorem of Calculus
- Applications of integration (area under a curve, volume of solids of revolution, work)

5. Applications of Integration:

- Finding areas between curves
- Volume by slicing, disks, and washers
- Volume by shells
- Arc length
- Surface area

6. Differential Equations:

- Introduction to differential equations
- Separable differential equations
- Exponential growth and decay models
- Logistic growth models

7. Transcendental Functions:

- Derivatives and integrals of exponential functions
- Derivatives and integrals of logarithmic functions
- Derivatives and integrals of trigonometric functions
- Inverse trigonometric functions and their derivatives
- Hyperbolic functions and their derivatives

8. Techniques of Integration:

- Integration by trigonometric substitution
- Integration by partial fractions
- Improper integrals

9. Parametric Equations and Polar Coordinates:

- Graphs of parametric equations
- Calculus with parametric curves
- Graphs of polar equations
- Calculus with polar curves

10. Infinite Sequences and Series:

- Convergence and divergence of sequences
- Convergence tests for infinite series (geometric series, p-series, alternating series test, ratio test, root test)
- Power series and Taylor series

11. Vectors and Vector-Valued Functions:

- Introduction to vectors in 2D and 3D
- Dot product and cross product
- Vector-valued functions
- Calculus with vector-valued functions (derivatives, integrals, velocity, acceleration)