

AP-Calculus-AB/BC

South Mecklenburg High School

Teacher: Bruce Bacon

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Room Number: A200

Tutoring Schedule: Tuesday 2:15-3:15 pm

Text/Phone Contact: please email

Website: <https://sites.google.com/cms.k12.nc.us/bacon>

Communication

All communication with students will be conducted through CMS emails and Canvas notifications.

Course Description:

I. Limits, Continuity, and Derivatives

A. Limits

1. Intuitive understanding of limits
 - a. Numerical
 - b. Graphical
2. Analytical interpretations
 - a. Laws of Limits
 - b. Limits at Infinity
 - i. Asymptotes
 - ii. End behavior
 - c. One-sided limits

B. Continuity

1. Intuitive understanding of continuity
 - a. Continuity at a point
 - b. Continuous functions
2. Limits and Continuity
 - a. Definition of Continuity
 - b. Discontinuity
3. Geometric understanding
 - a. Intermediate Value Theorem
 - b. Extreme Value Theorem

C. Derivatives

1. Intuitive understanding of the derivative
 - a. Numerical
 - b. Graphical
2. Definition of the derivative
3. Derivative at a Point
 - a. Average slope
 - b. Instantaneous slope
 - c. Tangent lines
 - d. Approximate rates of change
4. Derivative as a Function
 - a. Basic Differentiation Rules
 - b. Product, Quotient, and Power Rules
 - c. Chain Rule
 - d. Implicit Differentiation
 - e. higher-order Derivatives
5. Key Relationships
 - a. Continuity and Differentiability
 - b. Rolle's Theorem and Mean Value Theorem
 - c. First Derivative Test
 - d. Second Derivative Test
6. Applications of Derivatives
 - a. Curve Sketching
 - i. signs of f' and f''
 - ii. concavity
 - iii. points of inflection
 - b. Related Rates
 - c. Optimization (max-min problems)
 - d. Differentials
 - i. Slope fields

III. Integrals

A. Antiderivatives

B. Area Under a Curve

C. Reimann Sums

D. Fundamental Theorem of Calculus

E. Techniques of Integration

1. Integration by substitution
2. Numerical integration
 - a. Left and Right rectangles
 - b. Trapezoidal Rule

IV. Transcendental Functions

A. Derivatives and Integrals of Logarithms

B. Derivatives and Integrals of Exponential functions

C. Derivatives and Integrals of Trig/inverse trig functions

D. Applications of Derivatives and Integrals using above functions

E. Separable Differential Equations

F. Euler's Method

V. Applications of Integrals

A. Areas of Plane Regions

B. Volumes of solids (with known cross-sections)

C. Average value of a function

D. Accelerated Motion

VI. Additional BC Topics

A. Integration by parts

B. Integration by partial fractions

1. Logistics Growth

C. L'Hospitals Rule

D. Improper Integrals

1. Application of L'Hospitals Rule

E. Vectors

F. Calculus with Parametric Equations

1. Derivatives

2. Arc Length

G. Calculus with Polar Equations

1. Slope in Polar form

2. Area of Polar region

VII. Polynomial Approximations and Series

A. Sequences and Series

B. Convergence tests

1. Geometric, p-series, telescoping

2. Integral, comparison tests

3. Alternating series, ratio tests

C. Polynomial approximations

D. Power Series

1. Radius and Interval of convergence

2. Power series operations

E. Taylor and Maclaurin series

1. Maclaurin for $e^x, \sin x, \cos x$ and $\frac{1}{1-x}$

F. Error bounds and remainders

1. Convergent alternating series

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2. using integral test

3. Lagrange

Course Goals

Students who complete this course successfully will be able to:

- Use their understanding of Calculus
- Explain their reasoning for arriving at an answer or conclusion
- Critically think through a problem
- Collaborate with others to explore new topics
- Gain self confidence in their ability to understand and do mathematics
- **Calculus is a very demanding class and I am committed to supporting you as you work to master all of the objectives of the course.**

Required Texts, Materials, Equipment

- Graphing Calculator Recommended
- Recommended notebook or binder divided by Unit

Attendance and participation

Attendance is expected and required. Lessons will be taught and supplemental materials will be provided, including practice questions and videos.

All interactions in class will be civil, respectful, and supportive of an inclusive learning environment for all students. Please speak with me, student support services, or administration, about any concerns you may have about classroom participation and classroom dynamics.

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Grading:

Prepare (20%) - Smaller assignments that allow students to practice new learning such as warm ups and homework assignments.

Rehearse (30%) - Assignments that provide students with feedback on progress towards mastery of standards. Quizzes, mini-projects, classwork .etc

Perform-(50%) - Culminating/formative assessment that measure mastery of one or multiple standards . Unit assessment

Grading Scale

A= 100-90

B= 89-80

C= 79-70

D= 69-60

F= 59-50

Make-Up/ Late Work:

A student who misses homework or other assignments or due dates because of an absence, whether excused or unexcused, or fails to turn in their work by the due date will be allowed to make up the work. The student must turn in all make up work within 5 days of the unit assessment.

Questions, Comments, Concerns??

Please reach out to me at the contact information provided at the beginning of the syllabus. Email is the best way to reach me as I check that more often than Canvas messages. You can also call or text the google voice number provided.

*Communication will be key in this course as so much is changing and everyone is in a different situation!
Keep communication open and do not wait until the last minute to reach out. Remember, you must be responsible for you and what you want to achieve in this class!*