AP Calculus Course Syllabus
[Fall 2020]

Course Information

Mathematics
Calculus I
Math 170
Centennial High School Dual Credit

Suzie Fore
fore.suzanne@westada.org
208.855.4250 x1115

Course Description

This is the first course in the calculus sequence. It covers algebraic and transcendental functions; rate of change; limits; continuity; differentiation of algebraic, trigonometric, exponential, logarithmic, and hyperbolic functions; differentials; applications of differentiation; definite and indefinite integrals; area between curves; volumes; and other applications of integration, indeterminate forms, and L'Hôpital's rule.

Prerequisite(s): Honors MATH 3/Precalculus or equivalent placement score.

Schedule

- Daily meets either in-person or via Teams (depending on West Ada T1/T2 schedule)
  - M 1:10-1:55 remote / Tu 9:20 – 10:50am/ W 9:35 – 11:05am / Th 9:20 – 10:50am/F 9:20 – 10:50am
- Centennial High School rm 119 or via Teams (2A Q2 Fore AP Calculus Team)
- Q2 and Q3

Instructor Availability

- 7:15-7:40 M, Tu, Th, F /10:55 – 11:30am M-F/2:45 – 3:10 M-F (rm 115)
- Help via Teams also available by appointment for students home on Remote days.

Grading Policy

20% Final Exams (2 total)
70% Assessments (7 total)
10% Quizzes

A: 90 – 100%
B: 80 – 89%
C: 70 – 79%
D: 60 – 69%
F: 0 – 59%

All grades are rounded to the nearest whole percentage. For example a grade of 89.4% would get rounded to 89% and result in a B.

Students can look up their current grade using their login for PowerSchool. ***NO RETAKE grades will be allowed for CWI credit grades. Retakes will affect only the student's CHS grade.***

Textbooks and Required Materials

This class requires a Textbook that will be checked out to each student through the CHS Library.

- Calculus of a Single Variable, 8th Edition, Larson/Hostetler/Edwards, 2006. Houghton Mifflin Company. ISBN: 0-618-50304-8
- Scientific or Graphing Calculator (Ti-83 or Ti-84 recommended)

Course Expectations

- Students can expect to spend approximately 3 - 5 hours per week for this class outside of the classroom. Students should set aside regular time outside of class to complete assignments.
- Please set cell phones to silent and place in the hanging organizer when you enter the classroom.
- Please be in your seat and have any questions ready to go when class begins
- If you show up late, be courteous and find your seat quietly
- Notify the instructor if you must leave lecture early

Course Learning Outcomes

The Course Objective is to provide students with the mathematical foundation necessary (1) for students majoring in the mathematical and physical sciences, engineering, mathematics education, and related fields, and (2) to be able to develop strong mathematical reasoning skills, clear conceptual understanding, and the ability to think critically.
Students completing this course are expected to acquire the ability and skills to:

A. Graph functions, including trigonometric functions.
   1. Find the domain and range of functions and graph functions, including polynomial functions, absolute-value functions, rational functions, square root and cube functions, power functions, algebraic functions, exponential functions, logarithmic functions, and trigonometric functions.
   2. Find sums, differences, products, quotients, and compositions of functions.
   3. Shift, scale, and reflect graphs of functions.
   4. Evaluate trigonometric functions for special angles.
   5. Use trigonometric identities, including the Pythagorean identity, the Addition formulas, the Double-Angle formulas, the Half-Angle formulas, and the Law of Cosines.
   6. Understand the limitations of using a graphing utility, such as choosing an appropriate window and obtaining a complete graph.
   7. Find inverse functions.
   8. Use properties of logarithms.
   9. Graph arcsine and arccosine and identify their domains and ranges.

B. Find limits and determine whether a function is continuous.
   1. Calculate average and instantaneous rates of change.
   2. Find limits from graphs.
   3. Use the limit laws to calculate limits.

4. Eliminate common factors to find limits of rational functions.
5. Find limits of average rates of change.
6. Use the Sandwich Theorem (aka Squeeze Theorem) to find limits of functions.
7. Use the formal definition of a limit to prove limit statements.
8. Find one-sided limits graphically and algebraically.
9. Use the fact that the limit of the ratio of $\sin\theta$ and θ is 1, to find limits.
10. Apply the Continuity Test to determine whether a function is continuous at a point.
11. Find limits of continuous composite functions.
12. Apply the Intermediate Value Theorem for continuous functions to find solutions to equations.
13. Use limits involving infinity to find asymptotes.

C. Calculate derivatives of functions.
1. Find the tangent to the graph of a function.
2. Find the derivative of a function at a given point using the limit of the difference quotient.
3. Use the alternative formula for the derivative to calculate derivatives.
4. Identify cases when the derivative does not exist.
5. Understand the relationship between differentiability and continuity.
6. Apply differentiation rules for constant functions, powers, sums, differences, products, and quotients of functions.
7. Calculate higher-order derivatives.
8. Solve problems involving motion along a line, such as find displacement, average velocity, speed, and acceleration.
9. Calculate derivatives of trigonometric functions.
10. Apply the chain rule to find derivatives.
11. Use implicit differentiation to find derivatives.
12. Apply the Derivative Rule for Inverses to find derivatives of inverse functions.
13. Find derivatives of logarithms.
14. Use logarithmic differentiation to find the derivative.
15. Find derivatives of inverse trigonometric functions.
16. Solve related rates problems.
17. Approximate functions using linearization.
18. Use differentials to estimate change.

D. Use derivatives to solve application problems.
1. Find the absolute extrema of a continuous function.
2. Find values that satisfy the conclusion of the Mean Value Theorem.
3. Use the first derivative to determine the local extrema of a function.
4. Use the second derivative to test for concavity and for local extrema.
5. Use derivatives to graph functions.
6. Apply L'Hopital's Rule to find limits of rational functions having appropriate indeterminant forms.
7. Solve applied optimization problems, such as minimize perimeter or cost, or maximize volume or profit.
8. Apply Newton's Method to approximate roots.

E. Evaluate integrals.
   1. Find antiderivatives.
   2. Approximate area with finite sums.
   3. Find limits of finite sums.
   4. Use properties of definite integrals to evaluate integrals.
   5. Use definite integrals to find area of nonnegative functions.
   6. Find the average value of a continuous function using a definite integral.
   7. Use the Fundamental Theorem of Calculus to find derivatives of integrals and to evaluate definite integrals using antiderivatives.
   8. Apply the Substitution Method to evaluate indefinite integrals.
   9. Find the area between two curves.

F. Solve application problems involving definite integrals.
   1. Find the volume of a solid by slicing with parallel planes.
   2. Find the volume of a solid of revolution using the Disk Method
   3. Find the volume of a solid of revolution using the Washer Method.
   4. Find the volume of a solid of revolution using cylindrical shells.
   5. Find work done by a variable force.
   6. Find the work done to pump liquids from containers.

G. Solve problems involving integrals and transcendental functions.
   1. Evaluate integrals that result in a logarithmic function.
   2. Evaluate integrals that result in an exponential function.
   3. Solve separable differential equations involving exponential change, such as unlimited population growth, radioactivity, and heat transfer.
   4. Find derivatives of hyperbolic and inverse hyperbolic functions.
   5. Compare the growth rates of functions.

Outcomes Assessment

Students will be expected to complete homework daily and quizzes each chapter. There will be a total of 7 chapter exams throughout the year and 2 Final exams, one per semester. The tests will be administered in class and are expected to be completed in the allotted time given. In addition, students will occasionally be expected to complete assignments and projects in groups or using technology such as Geogebra/Desmos.