Course: AP Calculus BC
Teacher: Cindy Knoll
Room: 616
Prep Hour: 6

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Mission Statement:
The SOHS math department will ensure that all students will increase their competency in Math through quality instruction and collaboration.

Target Learning Goals:
1. Make sense of problems and persevere in solving them.
2. Understand what variables represent and how they can be used to model (equations) and solve problems.
3. Justify conclusions and critique the work of others.
4. Use appropriate tools strategically and attend to precision.
5. Use structure to identify patterns.

Course Description
Calculus AB is primarily concerned with developing the students’ understanding of the concepts of calculus and providing experience with its methods and applications. The course emphasizes a multirepresentational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically and verbally. The connections among these representations are also important. The course is intended to be challenging and demanding. Broad concepts and widely applicable methods are emphasized. The focus of the course is neither manipulation nor memorization of an extensive taxonomy of functions, curves, theorems, or problem types. Technology should be used regularly by students...to reinforce the relationships among the multiple representations of functions, to confirm written work, to implement experimentation, and to assist in interpreting results. Through the use of the unifying themes of derivatives, integrals, limits, approximation and applications and modeling, the course becomes a cohesive whole rather than a collection of unrelated topics. These themes are developed using all functions. (See: http://media.collegeboard.com/digitalServices/pdf/ap/ap-calculus-course-description.pdf)

Course Objectives (Topic Outline)

I. Functions, Graphs and Limits

Analysis of graphs. With the aid of technology, graphs of functions are often easy to produce. The emphasis is the interplay between the geometric and analytic information and the use of calculus both to predict and to explain the observed local and global behavior of a function.

Limits of functions (including one-sided limits)
- An intuitive understanding of the limiting process
- Calculating limits using algebra.
- Estimating limits from graphs or tables of data.

Asymptotic and unbounded behavior
- Understanding asymptotes in terms of graphical behavior.
- Describing asymptotic behavior in terms of limits involving infinity.
- Comparing relative magnitudes of functions and their rates of change (for example, contrasting exponential growth, polynomial growth and logarithmic growth).
Continuity as a property of functions
- An intuitive understanding of continuity. (The function values can be made as close as desired by taking sufficiently close values of the domain.)
- Understanding continuity in terms of limits
- Geometric understanding of graphs of continuous function (Intermediate Value Theorem an Extreme Value Theorem).

Parametric, polar, and vector functions.
- The analysis of planar curves includes those given in parametric form, polar form and vector form.

II. Derivatives

Concept of the derivative
- Derivative presented graphically, numerically and analytically.
- Derivative interpreted as an instantaneous rate of change.
- Derivative defined as the limit of the difference quotient.
- Relationship between differentiability and continuity.

Derivative at a point
- Slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are not tangents.
- Tangent line to a curve at a point and local linear approximation.
- Instantaneous rate of change as the limit of average rate of change.
- Approximate rate of change from graphs and tables of values.

Derivative as a function
- Corresponding characteristics of graphs of f and f’
- Relationship between the increasing and decreasing behavior of f and the sign of f’.
- The Mean Value Theorem and its geometric interpretation.
- Equations involving derivatives. Verbal descriptions are translated into equation involving derivatives and vice versa.

Applications of derivatives
- Analysis of curves, including the notions of monotonicity and concavity.
- Analysis of planar curves given in parametric form, polar form, and vector form, including velocity and acceleration.
- Optimization, both absolute (global) and relative (local extrema).
- Modeling rates of change, including related rates problems.
- Use of implicit differentiation to find the derivative of an inverse function.
- Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.
- Geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equation.
- Numerical solution of differential equations using Euler’s method.
- L’Hospital’s Rule, including its use in determining limits and convergence of improper integrals and series.

Computation of derivatives
- Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric and inverse trigonometric functions.
- Derivative rules for sums, products and quotients of functions.
- Chain rule and implicit differentiation.
- Derivatives of parametric, polar and vector functions.
III. Integrals

Interpretations and properties of definite integrals
- Definite integral as a limit of Riemann sums.
- Definite integral of the rate of a quantity over a time interval interpreted as the change of the quantity over the interval:
  \[ \int_{a}^{b} f(x) \, dx = f(b) - f(a) \]
- Basic properties of definite integrals (examples include additivity and linearity).

Applications of integrals. Appropriate integrals are used in a variety of applications to model physical, biological or economic situations. Although only a sampling of applications can be included in any specific course, student should be able to adapt their knowledge and techniques to solve other similar application problems. Whatever applications are chosen, the emphasis is on using the method of setting up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include find the area of a region (including a region bounded by polar curves), the volume of a solid with known cross sections, the average value of a function, the distance traveled by a particle along a line, the length of a curve (including a curve given in parametric form), and accumulated change from a rate of change.

Fundamental Theorem of Calculus
- Use the Fundamental Theorem to evaluate definite integrals.
- Use the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined.

Techniques of antidifferentiation
- Antiderivatives following directly from derivative of basic functions.
- Antiderivatives by substitution of variables (including change of limits for definite integrals), parts and simple partial fractions (nonrepeating linear factors only).
- Improper integral (as limits of definite integrals).

Applications of antidifferentiation
- Finding specific antiderivatives using initial conditions, including applications to motion along a line.
- Solving separable differential equations using them in modeling (including the study of the equation \( y' = ky \) and exponential growth).
- Solving logistic differential equations and using them in modeling.

Numerical approximations of definite integrals. Use of Riemann sums (using left, right and midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically and by tables of values.

IV. Polynomial Approximations and Series

Concept of a series. A series is defined as a sequence of partial sums, and convergence is defined in terms of the limit of the sequence of a partial sums. Technology can be used to explore convergence and divergence.

Series of constants
- Motivating examples, including decimal expansion.
- Geometric series with applications.
- The harmonic series.
- Alternating series with error bound.
- Terms of series as areas of rectangles and their relationship to improper integrals, including the integral test and its use in testing the convergence of \( p \)-series.
- The ratio test for convergence and divergence.
- Comparing series to test for convergence or divergence.
Taylor series
- Taylor polynomial approximation with graphical demonstration of convergence (for example, viewing graphs of various Taylor polynomials of the sine function approximating the sine curve).
- Maclaurin series and the general Taylor series centered at $x = a$.
- Maclaurin series for the functions $e^x$, $\sin x$, $\cos x$ and $\frac{1}{1-x}$.
- Formal manipulation of Taylor series and shortcuts to computing Taylor series, including substitution, differentiation, antidifferentiation, and the formation of a new series from a known series.
- Function defined by power series.
- Radius and interval of convergence of power series.
- Lagrange error bound for Taylor polynomials.

(See collegeboard.com/digitalServices/pdf/ap/ap-calculus-course-description.pdf)

Grading Policy
A = 90-100%
B = 80-90%
C = 70-79%
D = 60-69%
F = below 60%

- Grades are cumulative for each semester.
- The 18-week grade which comprises 80% of your overall course grade are as follows:
  Summative Tests/Projects 90%
  Classwork/Practice 10%
- The final exam will account for 20% of the semester final grade.
- No extra credit will be accepted.

Powerschool Access
The Powerschools site allows parents/guardians and students to access the student’s grades, attendance, and other information. If you need your access information, please stop by the front desk during business hours. You will need a photo I.D. The web address is: ps.dvusd.org/public

AP Exam Testing
It is the expectation that all students take the AP Calculus AB exam. All students will take a complete practice exam. This practice exam will be scheduled in advance and participation is mandatory as this is part of your final exam for the course.

All students, whether testing for Advanced Placement College Board credit or not, will sit for a full board exam on Thursday, May 5, 2015. Students testing for college credit will test with the appropriate facilitator. Students testing as their final exam will test with Mrs. Knoll. Exam check-in for all students is at 7:40 am and students will miss their 1-3 hour classes that day (as an excused internal school absence that will not count as an absence for school attendance policy purposes (code 8)). Participation in this exam date is not optional.

Test/Grade Recovery Policy
Tests: You must take tests the day they are given. An absence the day before the test will not excuse you from the test. Tests missed due to an absence must be made up within one week of the original test date. If a student is absent on the day of a test, the student is required to take the exam on the day of the return. It is the student’s responsibility to make the teacher aware. Failure to do so will result in a zero on the exam. Please contact me if there are extenuating circumstances. Grade Recovery: Students may be allowed to retake a test at the teacher’s discretion if they have completed all of their homework prior to the test. Students must meet with the teacher to discuss the particulars of the retest.
Make-Up Work
Upon return to class after an absence, a student has one school day for each day missed to make up work/test assigned during his/her absence regardless of the number of days absent. For example, if a student is absent on Thursday and Friday, he/she will have Monday and Tuesday of the following week to make up work and must turn in the work that was assigned during the days absent on Wednesday. It is the student’s responsibility to check with teachers immediately upon return for work missed. Teachers may choose to schedule an appointment with the student to formulate a plan for the completion of make-up work.

Coursework and assessments assigned prior to the absence(s) may still be due on the date assigned or due on the first day that the student returns to class.

Make-up work for extended absences can be accessed on the course website or may be requested through the Counseling Office and picked up there.

Late Work Policy
Late work will be accepted for partial credit up until the unit test is administered. Note: No revised work and/or retakes will be permitted during the last two weeks of a semester.

Long Term Project Policy
Long term projects are due on the date and time assigned, as defined in writing in advance by the teacher. NO EXCEPTIONS. THIS SUPERSEDES THE MAKE-UP POLICY. If the student is absent or the class does not meet that day, the PROJECT IS STILL DUE ON THE DAY ASSIGNED.

Classroom Behavior Expectations
- Be prepared to work quietly when the bell rings.
- Be polite and respect the rights of yourself and others.
- Be quiet when others are speaking.
- Be active participants in the learning process.
- Take responsibility for you actions.
- Do your personal best.

Electronic Device Use
Technology (cell phones, iPods, hand-held devices, etc.) use in the classroom is intended to enhance the learning environment for all students; however, any use of technology that substantially degrades the learning environment, promotes dishonesty or illegal activities, is prohibited. If the instructor determines that the use of technology is a distraction to the learning process, either of the student using the technology or to those around him/her, the student may, at the discretion of the teacher, be asked to discontinue the use of technology in the classroom.
Personal Electronic Device Use
Personal Electronic Devices include cell phones, iPods, other mp3 players and similar technology devices used for entertainment and communication/social media. Students are expected to refrain from the use of electronic devices for personal entertainment and/or communication (i.e. email, Instagram, Facebook, etc.) during instructional time (as determined by the teacher or classroom designee). While students may freely use these devices before and after school, during passing period, and at lunch- the teacher will limit the use of personal devices and for which purposes during class to ensure that all students are focused and ready to learn.

iPads and the Use of Electronic Devices to Facilitate Learning:
Sandra Day O’Connor High School will begin to integrate the use of tablets, laptops and smart phones as a learning tool in the classroom. Once the technology tools are added to the classroom for learning, the classroom teacher will inform students as to when they may use their device and for which purposes. Students must adhere to their teacher’s guidelines for use and appropriate times for use. Any student who violates the teacher’s guidelines will be subject to disciplinary action.

Please note- students may not access their personal devices, whether for entertainment or learning, if the teacher has stated that the classroom activities at that time do not warrant use. For example, during testing or assessments.

Adherence to the O’Connor Academic Integrity Code
All students enrolled in AP Calculus AB will adhere to the framework and guidelines set forth in the O’Connor High School Academic Integrity Code. Cheating and Plagiarism will not be tolerated. The purpose of this code is to promote a positive learning environment for all involved. As humans, we will make mistakes as we grow. It is understood that we can learn from those mistakes and become better individuals in the future. Any student who violates this code will be referred to the Students Rights and Responsibilities handbook and assignment of appropriate consequences.

Plagiarism and Cheating
Cheating: In cheating, a student is taking the work of another, on any assignment, and claiming it as his/her own. At SDOHS cheating includes but is not limited to:
• Copying and/or offering homework verbally, in written form, or by electronic means from/to another student.
• Copying and/or offering questions and/or answers on tests or quizzes verbally, in written form, or by electronic means from/to another student.
• Pressuring other students to copy and/or offer homework, answers and/or questions on tests or quizzes verbally, in written form or by electronic means.
• Bringing in and using unauthorized information during class time, including information stored in any electronic device.
• Offering or receiving information under circumstances in which information is not to be shared.
• Having anyone, including parents or tutors, complete assignments and submitting the work as one’s own.
• Presenting collaborative work as independent work and independent work as collaborative. (In group work, one person should not and will not bear the burden for the entire group assignment.)
• Copying answers from answer guides in texts.
• Fabricating data, information, or sources. Presenting made up material as authentic.

Plagiarism: The act of plagiarism may include direct copying, but it may also be more complex than verbatim repetition. A student, in preparing a project for a class, will have plagiarized if he/she has taken information from sources without citing the sources that have been used. Plagiarized material may appear in a student’s paper as word-for-word copying, a summation, or a paraphrase of another’s ideas. A student has plagiarized whether the material from another source has been taken in whole or in part. In effect, by not naming the source, the student is claiming the work of another as his/hers. At SDOHS plagiarism includes but is not limited to:
• Submitting images and/or documents in whole or in part from the Internet without citation of the source(s).
• Copying another’s work.
• Using another’s ideas without proper citations.
• Incorporating portions of another’s writing within the context of your own work.
• Failing to acknowledge a source of information.
• Using “unique” phrases without citations.
• Using graphics, charts, diagrams, or illustrations without citations.
• Using a translator (either in-person or on-line) without proper citations.

Plagiarism and/or Cheating will result in disciplinary actions and a 0%, with no option to redo/retake. - no exceptions.
**Loss of Credit Due to Absences**

Upon reaching 5 unexcused absences or a combination of 12 unexcused and/or excused absences, a student may **lose credit** in any given class.

Any student may be placed on an Attendance Contract upon accumulating multiple excused and unexcused absences. Any student with excessive absences may:
1. Lose credit in one or more classes.
2. Lose parking privileges.

**Communication**

Please contact the teacher for any student concerns. It is crucial that teachers, parents, and students maintain open lines of communication in order to ensure the best support for student success. Contact information is provided at the top of the first page of this syllabus.

The Deer Valley Unified School District does not discriminate on the basis of race, color, national origin, sex, disability, or age in its programs and activities. For any inquiries regarding nondiscrimination policies contact the Superintendent's Department, 20402 N. 15th Avenue, Phoenix, AZ 85027. 623.445.5000.