California State University, Northridge
Summer Academic Enrichment Program

Calculus AB

Course Overview:
This is a rigorous course designed to complete a year-long Calculus AB class during our five-week summer school. Thus, the students are taught at an accelerated pace and should expect to have a minimum of one hour of homework each night. In order to be successful in this course, students need a strong background in Math Analysis/Trigonometry and a consistent work ethic. Be aware that the course is not an introduction to Calculus. If the student needs to complete just one semester of this course, you may register for just that one semester. However, there is no fee reduction. Also, if the student only needs to take the second semester, we recommend that your child attend the first semester as well to help prepare them for the second.

Course Description:
Calculus is the study of change. This class will study the three major concepts of calculus which have become integral tools in understanding our world. The concepts of limits, derivatives, and integrals have many applications in science, business, engineering, architecture, and computers. This summer course is meant to provide a low-pressure environment where individual attention by the teacher and personal reflection by the student is highly promoted. The volume of content to be learned will be intense and challenging. It is therefore the student's responsibility to ask questions, complete assignments, and seek tutoring as needed.

Attendance is mandatory for learning to take place. Please be in class, and don't get behind. Please give yourself extra time to get here in the mornings; being tardy is a distraction to the class's attention.

Course Goals and Objectives
Correlates with the California State Standards

1.0 Students demonstrate knowledge of both the formal definition and the graphical interpretation of limit of values of functions. This knowledge includes one-sided limits, infinite limits, and limits at infinity. Students know the definition of convergence and divergence of a function as the domain variable approaches either a number or infinity:

1.1 Students prove and use theorems evaluating the limits of sums, products, quotients, and composition of functions.

1.2 Students use graphical calculators to verify and estimate limits.

1.3 Students prove and use special limits, such as the limits of $(\sin(x))/x$ and $(1-\cos(x))/x$ as x tends to 0.

2.0 Students demonstrate knowledge of both the formal definition and the graphical interpretation of continuity of a function.

3.0 Students demonstrate an understanding and the application of the intermediate value theorem and the extreme value theorem.

4.0 Students demonstrate an understanding of the formal definition of the derivative of a function at a point and the notion of differentiability:

- 4.1 Students demonstrate an understanding of the derivative of a function as the slope of the tangent line to the graph of the function.
- 4.2 Students demonstrate an understanding of the interpretation of the derivative as an instantaneous rate of change. Students can use derivatives to solve a variety of problems from physics, chemistry, economics, and so forth that involve the rate of change of a function.
- 4.3 Students understand the relation between differentiability and continuity.
- 4.4 Students derive derivative formulas and use them to find the derivatives of algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic functions.

5.0 Students know the chain rule and its proof and applications to the calculation of the derivative of a variety of composite functions.

6.0 Students find the derivatives of parametrically defined functions and use implicit differentiation in a wide variety of problems in physics, chemistry, economics, and so forth.

7.0 Students compute derivatives of higher orders.

8.0 Students know and can apply Rolle's theorem, the mean value theorem, and L'Hôpital's rule.

9.0 Students use differentiation to sketch, by hand, graphs of functions. They can identify maxima, minima, inflection points, and intervals in which the function is increasing and decreasing.

10.0 Students know Newton's method for approximating the zeros of a function.

11.0 Students use differentiation to solve optimization (maximum-minimum problems) in a variety of pure and applied contexts.

12.0 Students use differentiation to solve related rate problems in a variety of pure and applied contexts.

13.0 Students know the definition of the definite integral by using Riemann sums. They use this definition to approximate integrals.

14.0 Students apply the definition of the integral to model problems in physics, economics, and so forth, obtaining results in terms of integrals.

15.0 Students demonstrate knowledge and proof of the fundamental theorem of calculus and use it to interpret integrals as antiderivatives.

16.0 Students use definite integrals in problems involving area, velocity, acceleration, volume of a solid, area of a surface of revolution, length of a curve, and work.

17.0 Students compute, by hand, the integrals of a wide variety of functions by using techniques of integration, such as substitution, integration by parts, and trigonometric substitution. They can also combine these techniques when appropriate.

18.0 Students know the definitions and properties of inverse trigonometric functions and the expression of these functions as indefinite integrals.

19.0 Students compute, by hand, the integrals of rational functions by combining the techniques in standard 17.0 with the algebraic techniques of partial fractions and completing the square.

20.0 Students compute the integrals of trigonometric functions by using the techniques noted above.

21.0 Students understand the algorithms involved in Simpson's rule and Newton's method. They use calculators or computers or both to approximate integrals numerically.

22.0 Students understand improper integrals as limits of definite integrals.

23.0 Students demonstrate an understanding of the definitions of convergence and divergence of sequences and series of real numbers. By using such tests as the comparison test, ratio test, and alternate series test, they can determine whether a series converges.

24.0 Students understand and can compute the radius (interval) of the convergence of power series.

25.0 Students differentiate and integrate the terms of a power series in order to form new series from known ones.

26.0 Students calculate Taylor polynomials and Taylor series of basic functions, including the remainder term.

27.0 Students know the techniques of solution of selected elementary differential equations and their applications to a wide variety of situations, including growth-and-decay problems.

Calculus

Week 1

Day 1- Ch. 1 (All): Functions and Models
- Review Syllabus
- Diagnostic test
- Function Representations
- Catalog of Functions
- Function Transformations
- Graphing Functions

Day 2- Ch. 2 (2.1-2.3): Limits and Rates of Change
- Homework Questions
- Chapter 1 Quiz
- Tangent and Velocity
- Limits of Functions
- Limit Laws

Day 3- Ch. 2 (2.4-2.6)
- Homework Questions
- Quiz 2.1-2.3
- Limit Definition
- Continuity
- Tangents, Velocities, and Rates of Change

Day 4- Ch. 3 (3.1, 3.2): Derivatives
- Homework Questions
- Ch. 2 Review
- Chapter 2 Exam
- Derivatives
- Derivatives as Functions

Day 5- Ch. 3 (3.3- 3.5)
- Homework Questions
- Differentiation Formulas
- Rates of Change
- Trigonometric Derivatives

Week 2

Day 6- Ch. 3 (3.6-3.9)

Day 12- Ch. 4: Derivative Project Presentations
- Ch 1 Review
- Ch. 2 Review
- Ch. 3. Review
- Ch. 4 Review

Day 13- Final Calculus A
- Final Review Questions
- Final Exam
- Final Exam Questions

Day 14- Ch. 5 (5.1-5.3) Integrals
- Areas and Distances
- Definite Integral
- Fundamental Theorem of Calculus

Week 4

Day 15- Ch. 5 (5.4-5.5)
- Homework Questions
- Ch. 5 Quiz
- Indefinite Integrals
- Substitution Rule

Day 16- Ch. 6 (6.1-6.2)) Applications of Integration
- Homework Questions
- Ch. 5 Exam
- Areas between Curves
- Volumes

Day 17- Ch. 6 (6.3-6.5)
- Homework Questions
- Volumes by Cylindrical Shells
- Work
- Average Value of a Function

Day 18- Ch. 7(7.1-7.2): Inverse Functions
- Homework Questions
- Ch. 6 Review

- Homework Questions
- The Chain Rule
- Implicit Differentiation
- Higher Derivatives
- Related Rates

Day 7- Ch. 4 (4.1-4.2) Applications of Differentiation
- Homework Questions
- Chapter 3 Review
- Chapter 3 Exam
- Maximum/Minimum Values
- Mean Value Theorem

Day 8- Ch. 4 (4.3-4.5)
- Homework Questions
- Derivatives and Graphing
- Limits at Infinity
- Curve Sketching

Day 9- Ch. 4 (4.5-4.6)
- Homework Questions
- Ch. 4 Quiz
- Graphing with Calculators

Week 3

Day 10- Ch. 4 (4.7-4.8)
- Homework Questions
- Optimization Problems
- Business/Economics Applications
- Derivative Project

Day 11- Ch. 4
- Homework Questions
- Chapter 4 Exam
- Derivative Project
- Ch. 6 Exam
- Inverse Functions
- Derivatives of Exponential Functions

Day 19- Ch. 7 (7.3-7.4)
- Homework Questions
- Logarithmic Functions
- Derivatives of Logarithmic Functions

Week 5

Day 20- Ch. 7 (7.4-7.5)
- Homework Questions
- Ch. 7 Quiz
- Derivatives of Logarithmic Function
- Inverse Trigonometric Functions

Day 21- Ch. 7
- Homework Questions
- Ch. 7 Review
- Ch. 7 Exam
- Integration Project
- Ch. 7 Review

Day 22- Ch. 5-7
- Homework Questions
- Integration Project

Day 23- Ch. 5-7
- Presentations
- Ch. 5 Review
- Ch. 6 Review

Day 24- Final Calculus B
- Final Review Questions
- Final Exam
- Final Exam Questions

Course Materials:

Textbook: J. Stewart. *Calculus-Single Variable* . 5th Edition. 2003. Belmont, CA: Thomson Learning Inc..

Textbook will be provided to student on the first day of class.

PLEASE NOTE: You will be charged a fine for a damaged or lost textbook.

Each student is to have the following materials daily:
1. Notebook
2. 3-hole punched lined, college-rule paper.
3. Pencils and pens
4. Graphing calculator

Course Grading

- **Homework** is assigned daily and is due the following school day. Each assignment is worth ***10 points***.
- **Quizzes** will be given periodically as indicated in the calendar.
- **Projects** will be assigned each semester. One will highlight derivatives. The other will emphasize integration.
- **Chapter Exams** will be given at the end of each unit (chapter) of study.
- **Class participation** will be comprised of your class work, notebook, and discussion involvement.
- A **Final Exam** will be given after each 2 ½ week session marking the end of each semester.

Homework	15%
Quizzes	15%
Ch. Exam	20%
Project	20%
Final Exam	20%
Class Participation	10%

Grading Policy:

A	=	100% to 94%
A-	=	93% to 90%
B+	=	89% to 87%
B	=	86% to 83%
B-	=	82% to 80%
C+	=	79% to 77%
C	=	76% to 73%
C-	=	72% to 70%
D+	=	69% to 67%
D	=	66% to 63%
D-	=	62% to 60%
F	=	59% & Below

Classroom Behavior:

The student is expected to demonstrate mature, polite behavior and extend courtesy to everyone at all times:

1. Actively participate, and respectful verbal and nonverbal interaction with all opinions must be shown at all times.
2. Since differing views will be expressed, the teacher and the student(s) will mutually maintain a safe environment for courteous dialogue.
3. Respect is to be shown for all CSUN property.
4. No food or beverages will be permitted in the classroom. Snacks must be eaten outside between the designated breaks.
5. Warnings for behavior / discipline problems will be given once. Any further problems will result in a phone call to the parent(s) or guardian(s) and possible dismissal from the program.

SAEP Electronics Policy

Cell phones, music players and headphones are not permitted to be used during class hours.

a. Please put your cell phone on silent (NOT vibrate).
b. No texting is allowed during class.

You will be given one verbal warning if the above is not followed. Should a second warning be necessary, your cell phone, music player and/or headphones will be confiscated and held by the teacher until after class. If a third time occurs, your cell phone, music player and/or headphones will be confiscated and held in the SAEP office and MUST BE PICKED UP BY A PARENT.

Calculus AB

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After reading through the syllabus, please sign and date and have your student return it to class. The signature constitutes your commitment to the class as we partner to make the next five weeks a life-long educational experience for your student.

Student/ Parent Agreement:
Please bring this signed and dated **Calculus AB** syllabus agreement to class tomorrow.

If you do not understand any portion of this syllabus, or if you have any questions regarding this class, please do not hesitate to email the teacher.

We have read and understand the contents of this syllabus.

Student name ____

Student signature____

Date__________________

Parent/Guardian name ____

Parent/Guardian signature____

Date_________________

Phone ____

E-mail____
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