Dominican International School
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COURSE SYLLABUS

School Year	2026-2027
Subject	AP CALCULUS AB
Grade Level	12
Teacher	Karen Lai
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COURSE DESCRIPTION:

Calculus is one of the most important areas of mathematics. This course is designed to help students build a solid foundation of math so that they will do well in the AP Exam and be better prepared for their future studies in colleges. Students will be introduced to the concepts and techniques of calculus through a comprehensive study of all of the topics outlined in the College Board's *Course and Exam Description: AP Calculus AB*.

COURSE OBJECTIVES:

By the end of the school year, students will be able to:

- Work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal. They should understand the connections among these representations.
- Understand the meaning of the derivative in terms of a rate of change and local linear approximation, and use derivatives to solve a variety of problems.
- Interpret the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of change, and use integrals to solve a variety of problems.
- Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
- Communicate mathematics and explain solutions to problems both verbally and in written sentences.

- Model a written description of a physical situation with a function, a differential equation, or an integral.
- Use technology to help solve problems, experiment, interpret results, and support conclusions.
- Determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.
- Develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.

TEACHING STRATEGIES:

Classroom interaction is emphasized. Instead of one-way teaching, students will be challenged with problems and encouraged to come up with their own solutions. Group discussion will sometimes be organized and each group will then be invited to present the solution to the class. Students will be encouraged to discover the richness of meaning and idea behind an equation or problem solving technique. Each student will have the opportunity to present and explain her or his idea on the board to their classmates. When they present their ideas or solutions on the board, they will be communicating mathematics both verbally and in written sentences.

For student activities, students in each group work together and present their conclusions in a single paper that should emphasize justifications of the mathematics and quality of the presentation. The paper concludes with a student reflection on how confident they are in sharing their knowledge on these topics.

Through this kind of discussions and activities, students will have the opportunity to work with functions in a variety of ways - graphically, numerically, analytically and verbally. Most importantly, connections among these representations will be emphasized, and students will be expected to relate the various representations to each other. It's important for students to understand that graphs and tables are not always sufficient to prove an idea. Analytic argument is usually required for verification purpose.

PRIMARY TEXTBOOKS AND OTHER RESOURCES:

Hass, Heil, Bogacki, Weir, *Thomas' Calculus: Early Transcendentals*, 15th Edition, Pearson.

The required online textbook companion is the Pearson MyMathLab site: *https://www.pearsonmylabandmastering.com/northamerica/mymathlab/*

College Board MyAP Practice: *https://myap.collegeboard.org/*

Finney, Demana, Waits, Kennedy, and Bressoud, *Calculus (AP* Edition) - Graphical, Numerical, Algebraic,* 5th edition, Pearson.

GRADING SYSTEM/ASSESSMENT:

Students will be assessed with classroom participation, homework, quiz and quarter exams. Homework includes 5 to 10 problems per day during weekdays and 20 review problems for weekends. Weekly quizzes will help identify any weakness students may have, and which topics need additional enhancement. Quarter Exams will be given at the end of each quarter. To help students better prepared for the AP exam, old AP exam problems will be incorporated into homework and quarter exams.

TECHNOLOGY RESOURCES- GRAPHING CALCULATOR:

Graphing calculators, Ti-*nspire CX* (non-CAS), will be used to enhance the learning experience. Students will learn to use graphing calculators to help solve problems, interpret results, and support conclusions.

ADDITIONAL INFORMATION:

Please always check Google Classroom for homework and announcements.

ACADEMIC DISHONESTY:

Academic Dishonesty means employing a method or technique or engaging in conduct in an academic endeavor that contravenes the standards of ethical integrity expected at DIS.

Academic dishonesty includes but is not limited to the following:

- Purposely incorporating the ideas, words of sentences, paragraphs, or parts thereof without appropriate acknowledgment and representing the product as one's work;
- Representing another's intellectual work, such as photographs, paintings, drawings, sculpture, research, or the like, as one's own, including failure to attribute content to an AI.
- Employing a tutor, using Artificial Intelligence without acknowledgment, getting a parent to write a paper or do an assignment, and paying for an essay to be written by someone else and presented as the student's work.
- Committing any act that a reasonable person would conclude, when informed of the evidence, to be a dishonest means of obtaining or attempting to obtain credit for academic work.

Any act of academic dishonesty will result in an automatic zero on the entire assignment/learning task.

COURSE PLANNER:

The following represents the topics covered in this course.

First Quarter Tentative Course Content

Week/Date	Topic/Projects/Assessments
Week 1 (Aug 11-14) **4 days of class** 11 Morning Assembly 14 Opening Mass & Assumption of Our Lady 8:00	Pre-calculus Review • Functions and Their Graphs • Combining Functions • Shifting and Scaling Graphs • Power Functions • Trigonometric Functions

Week 2 (Aug 17-21)	Pre-calculus Review • Exponential Functions • Inverse Functions • Logarithmic Functions • Inverse Trigonometric Functions
Week 3 (Aug 24-28)	Limits and Continuity • Introducing Calculus: Can Change Occur at an Instant? • Defining Limits and Using Limit Notation • Estimating Limit Values from Graphs • Estimating Limit Values from Tables • Determining Limits Using Algebraic Properties of Limits • Determining Limits Using Algebraic Manipulation • Selecting Procedures for Determining Limits • Determining Limits Using the Squeeze Theorem • Connecting Multiple Representations of Limits
Week 4 (Aug 31-Sep 4)	Limits and Continuity • Exploring Types of Discontinuities • Defining Continuity at a Point • Confirming Continuity over an Interval • Removing Discontinuities • Connecting Infinite Limits and Vertical Asymptotes • Connecting Limits at Infinity and Horizontal Asymptotes • Working with the Intermediate Value Theorem (IVT)
Week 5 (Sep 7-11) 7 Holy Mass 8:00	Differentiation: Definition and Basic Derivative Rules • Defining Average and Instantaneous Rates of Change at a Point

	• Defining the Derivative of a Function and Using Derivative Notation • Estimating Derivatives of a Function at a Point • Connecting Differentiability and Continuity: Determining When Derivatives Do and Do Not Exist
Week 6 (Sep 14-18)	Differentiation: Definition and Basic Derivative Rules • Applying the Power Rule • Derivative Rules: Constant, Sum, Difference, and Constant Multiple • Derivatives of cos x, sin x, e^x and ln x
Week 7 (Sep 21-25) 22-24 Pre-Exam Days 25 Moon Festival (Public Holiday)	Differentiation: Definition and Basic Derivative Rules • The Product Rule • The Quotient Rule • Finding the Derivatives of tan x, cot x, sec x, and csc x Functions
Week 8 (Sep 28-Oct 2) Sep 28 Confucius Day (Public Holiday) Oct 1-2 First Quarter Exam (half day)	Review • Limit and Continuity • Differentiation: Definition and Basic Derivative Rules • 1st Quarter Exam
Week 9 (Oct 5-9) 5 Record Day (Student Holiday) 6 Teachers Conference Mass (Student Holiday) 9 Double 10 (Public Holiday)	Teacher's Conference (Oct 6-8)

Second Quarter Tentative Course Content

Week/Date	Topic/Projects/Assessments
Week 1 (10) (Oct 12-16)	Differentiation: Composite, Implicit, and Inverse Functions • The Chain Rule • Implicit Differentiation • Differentiating Inverse Functions
Week 2 (11) (Oct 19-23)	Differentiation: Composite, Implicit, and Inverse Functions • Differentiating Inverse Trigonometric Functions • Selecting Procedures for Calculating Derivatives • Calculating Higher-Order Derivatives
Week 3 (12) (Oct 26-30) 25-26 Retrocession Day (Public Holiday)	Contextual Applications of Differentiation • Interpreting the Meaning of the Derivative in Context • Straight-Line Motion: Connecting Position, Velocity, and Acceleration • Rates of Change in Other Applied Contexts (Non-Motion Problems) • Introduction to Related Rates
Week 4 (13) (Nov 2-6) 2 All Soul's Day Mass 8:00	Contextual Applications of Differentiation • Solving Related Rates Problems • Approximating Values of a Function Using Local Linearity and Linearization • Using L'Hospital's Rule for Determining Limits of Indeterminate Forms
Week 5 (14) (Nov 9-13)	Analytical Applications of Differentiation

	• Using the Mean Value Theorem • Extreme Value Theorem, Global Versus Local Extrema, and Critical Points • Determining Intervals on Which a Function Is Increasing or Decreasing • Using the First Derivative Test to Determine Relative (Local) Extrema • Using the Candidates Test to Determine Absolute (Global) Extrema
Week 6 (15) (Nov 16-20)	Analytical Applications of Differentiation • Determining Concavity of Functions over Their Domains • Using the Second Derivative Test to Determine Extrema • Sketching Graphs of Functions and Their Derivatives • Connecting a Function, Its First Derivative, and Its Second Derivative
Week 7 (16) (Nov 23-27) 24-26 Pre-Exam Days 27 G12 Second Quarter Exam	Review • Differentiation: Composite, Implicit, and Inverse Functions • Contextual Applications of Differentiation • Analytical Applications of Differentiation • 2nd Quarter Exam
Week 8 (17) (Nov 30-Dec 4) 30 G12 Second Quarter Exam	Analytical Applications of Differentiation • Introduction to Optimization Problems • Solving Optimization Problems • Exploring Behaviors of Implicit Relations
Week 9 (18) (Dec 7-11) 8 Foundation Day Mass 9:00, Cake Ceremony, Christmas Fair (Whole day) 10-11 Second Quarter Exam	Integration and Accumulation of Change • Exploring Accumulations of Change • Approximating Areas with Riemann Sums

(half day)	• Riemann Sums, Summation Notation, and Definite Integral Notation
Dec 14 to Jan 1 Christmas Break	

Third Quarter Tentative Course Content

Week/Date	Topic/Projects/Assessments
Week 1 (19) (Jan 4-8) 4 Record Day (Student Holiday) 8 New Year Mass 8:00	Integration and Accumulation of Change • Riemann Sums, Summation Notation, and Definite Integral Notation • The Fundamental Theorem of Calculus and Accumulation Functions • Interpreting the Behavior of Accumulation Functions Involving Area • Applying Properties of Definite Integrals • The Fundamental Theorem of Calculus and Definite Integrals
Week 2 (20) (Jan 11-15)	Integration and Accumulation of Change • Finding Antiderivatives and Indefinite Integrals: Basic Rules and Notation • Integrating Using Substitution • Integrating Functions Using Long Division and Completing the Square
Week 3 (21) (Jan 18-22)	Integration and Accumulation of Change • Selecting Techniques for Antidifferentiation Applications of Integration

	• Finding the Average Value of a Function on an Interval • Connecting Position, Velocity, and Acceleration of Functions Using Integrals • Using Accumulation Functions and Definite Integrals in Applied Contexts
Week 4 (22) (Jan 25-29) 28 Feast Day of St. Thomas Aquinas	Applications of Integration • Finding the Area Between Curves Expressed as Functions of *x* • Finding the Area Between Curves Expressed as Functions of *y* • Finding the Area Between Curves That Intersect at More Than Two Points
Week 5 (23) (Feb 1-5) 4-5 Little New Year's Eve (Public Holiday)	Applications of Integration • Volumes with Cross Sections: Squares and Rectangles • Volumes with Cross Sections: Triangles and Semicircles • Volume with Disc Method: Revolving Around the *x*- or *y*-Axis • Volume with Disc Method: Revolving Around Other Axes
Feb 5-12 Chinese New Year Holiday	
Week 6 (24) (Feb 15-19)	Applications of Integration • Volume with Disc Method: Revolving Around Other Axes • Volume with Washer Method: Revolving Around the *x*- or *y*-Axis • Volume with Washer Method: Revolving Around Other Axes
Week 7 (25) (Feb 22-26)	Differential Equations

22-26 IOWA Assessments	• Modeling Situations with Differential Equations • Verifying Solutions for Differential Equations • Sketching Slope Fields • Reasoning Using Slope Fields
Week 8 (26) (Mar 1-5) 1 Memorial Day (Public Holiday) 2-4 Pre-Exam Days	Differential Equations • Finding General Solutions Using Separation of Variables • Finding Particular Solutions Using Initial Conditions and Separation of Variables • Exponential Models with Differential Equations
Week 9 (27) (Mar 8-12)	Review • Integration and Accumulation of Changes • Applications of Integration • Differential Equations
Week 10 (28) (Mar 15-19)	Review • 3rd Quarter Exam • Barron's Prep: Chapter 2 Limit and Continuity • Barron's Prep: Chapter 3 Differentiation
Week 11 (29) (Mar 22-26) 23-24 Third Quarter Exam (half day) 25-26 Easter Break (Spring Break)	Review • Barron's Prep: Chapter 4 Applications of Differential Calculus • Barron's Prep: Chapter 5 Anti-Differentiation
Mar 25-Apr 2 Easter & Spring Break	

Fourth Quarter Tentative Course Content

Week/Date	Topic/Projects/Assessments
Week 1 (30) (Apr 5-9) 5 Tomb Sweeping Day (Public Holiday) 6 Children's Day (Public Holiday)	Review • Barron's Prep: Chapter 6 Definite Integrals • Barron's Prep: Chapter 7 Applications of Integration to Geometry
Week 2 (31) (Apr 12-16)	Review • Barron's Prep: Chapter 8 Further Applications of Integration • Barron's Prep: Chapter 9 Differential Equations
Week 3 (32) (Apr 19-23) 19-23 AP Mock Exams	Review • Mock Exam (4th Quarter Exam)
Week 4 (33) (Apr 26-30) 27-29 Pre-Exam Days 30 Labor Day (Public Holiday)	Review • Discuss the Mock Exam • Concepts covered throughout the year • Specific techniques expected to be mastered for the AP exam • Requirements and expectations in taking the AP exam • Practice Exam I
Week 5 (34) (May 3-7) 3-7 Final Exams (K, G5, 8, & 12) 3-14 AP Exams	Review • Discuss Practice Exam I • Concepts covered throughout the year • Specific techniques expected to be mastered for the AP exam • Requirements and expectations in taking the AP exam • Practice Exam II

Week 6 (35) (May 10-14) 3-14 AP Exams 12-13 Fourth Quarter Exam-Undergraduate (half day) 14 Record Day (Student Holiday)	AP exam- May 11 (8:00-12:00)
Week 7 (36) (May 17-21) 17 G12 Recollection (Morning) 17 Baccalaureate Mass (Afternoon, Schoolwide) 19 House Sports Day 20 High School Field Trip 21 House Culminating Activity 17-21 Student Clearance Days & Special Events	Clearance and Graduation Preparation
Week 8 (37) (May 24-28) 24 Middle & High School Sports Day 24 LS Field Trip 25 Kindergarten Graduation/G5 Promotion 26 G8 Graduation and G12 Graduation 27 Pre-Kindergarten & G1-4, 6 & 7, 9-11 Recognition 28 Last day of School for Students 31 Last day for Teachers/Staff Meeting	Clearance and Graduation Preparation

"Kindling the Light of Faith, Hope, and Love: The Legacy of St. Dominic de Guzmán"