2014-2015 AP Calculus AB/IPFW MA 16500 Syllabus

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COURSE OVERVIEW

The main objective I have in teaching AP® Calculus is to enable students to develop a passion for mathematics and begin to see truly applicable situations where calculus is needed. Students will receive a strong beginning to upper-level mathematics that will enable them to succeed in future mathematics courses. Students will also be challenged to think critically and learn tools they may later use in reading mathematics textbooks.

REQUIRED MATERIALS

Text Book: **Calculus of a Single Variable**, 9 ed., Edwards and Larson, Houghton Mifflin, 2010
Supplemental Book: **Fast Track to a 5: Preparing for the AP* Calculus AB and Calculus BC Examinations**, Cade, Caldwell, and Lucia, Houghton Mifflin, 2010
Graphing Calculator: TI-89, Texas Instruments, will be used in class

COURSE CURRICULUM

Overview:

Semester 1: Chapters 1-4
Chapter 1: Limits and Their Properties
Chapter 2: Differentiation
Chapter 3: Applications of Differentiation
Chapter 4: Integration

Semester 2: Chapters 5-7
Chapter 5: Logarithmic, Exponential, and other Transcendental Functions
Chapter 6: Differential Equations
Chapter 7: Applications of Integration
Review for AP Exam

Topic Sequence: [C2]

LIMITS AND THEIR PROPERTIES (Chapter 1)
4 weeks

1. The Tangent Line Problem **[C3]**
2. Limits Graphically and Numerically **[C3] [C5]**
3. Limits Analytically **[C3]**
4. Continuity and One-Sided Limits **[C5]**
5. Infinite Limits **[C5]**

DIFFERENTIATION (Chapter 2)
5 weeks

1. The Tangent Line Problem Solved **[C3]**
2. Basic Differentiation Rules
3. Rates of Change
4. Product and Quotient Rules
5. Higher-Order Derivatives

C1—The teacher has read the most recent AP® Calculus Course Description.

6. The Chain Rule
7. Implicit Differentiation
8. Related Rates

APPLICATIONS OF DIFFERENTIATION (Chapter 3)

5 weeks

1. Extrema on an Interval **[C3] [C5]**
2. Rolle's Theorem and the Mean Value Theorem **[C3]**
3. Increasing and Decreasing Functions
4. The First Derivative Test **[C4] [C5]**
5. Concavity
6. The Second Derivative Test **[C4] [C5]**
7. Curve Sketching **[C3] [C5]**
8. Optimization
9. Differentials

INTEGRATION (Chapter 4)

5 weeks

1. Antiderivatives
2. Indefinite Integration
3. Approximating Area **[C5]**
4. Riemann Sums
5. Definite Integrals
6. The Fundamental Theorem of Calculus
7. Integration by Substitution
8. Numerical Integration by the Trapezoidal Rule **[C3]**

MIDTERM EXAM

LOGARITHMIC, EXPONENTIAL AND OTHER TRANSCENDENTAL FUNCTIONS (Chapter 5)

3 weeks

1. A Review of Logarithms and Their Properties
2. Natural Logarithmic Function: Differentiation
3. Natural Logarithmic Function: Integration
4. Inverse Functions **[C3] [C5]**
5. Exponential Functions: Differentiation and Integration
6. Bases Other than e and Applications
7. Inverse Trigonometric Functions: Differentiation
8. Inverse Trigonometric Functions: Integration

DIFFERENTIAL EQUATIONS (Chapter 6)

2 weeks

1. Slope Fields **[C5]**
2. Differential Equations: Growth and Decay
3. Separation of Variables and the Logistic Equation

APPLICATIONS OF INTEGRATION (Chapter 7)

5 weeks

1. Area of a Region Between Two Curves **[C5]**
2. Volume: The Disk and Washer Methods
3. Volume: The Shell Method

C2—The course teaches all topics associated with Functions, Graphs, and Limits; Derivatives; Integrals as delineated in the Calculus AB Topic Outline in the AP® Calculus Course Description.

C3—The course provides students with the opportunity to work with functions represented in a variety of ways—graphically, numerically, analytically, and verbally—and emphasizes the connections among these representations.

C4—The course teaches students how to communicate mathematics and explain solutions to problems both verbally and in written sentences.

C5—The course teaches students how to use graphing calculators to help solve problems, experiment, interpret results, and support conclusions.

4. Arc Length
5. Surfaces of Revolution

AP EXAM REVIEW

4 weeks

INTEGRATION TECHNIQUES, L'HÔPITAL'S RULE, AND IMPROPER INTEGRALS (Chapter 8)

3 weeks

1. Basic Integration Rules
2. Integration by Parts
3. Trigonometric Integrals
4. Trigonometric Substitution
5. Indeterminate Form and L'Hôpital's Rule

FINAL EXAM

<u>HOMEWORK ASSIGNMENT GOALS</u> [C2]

Sect. 1.1 – 1.5: Relate finding limits analytically, numerically and graphically. **[C3] [C5]**
Students will experiment with the graphing calculator to approximate slopes.
Students should be able to relate functions analytically, graphically and numerically.
Students should be able to verbally explain what occurrences in the function represent.
Students will also experiment with the graphing calculator to observe local linearity. **[C5]**

Sect. 2.1 – 2.5: Students will learn basic differentiation rules.
Students will learn implicit differentiation rules.
Use secant lines to approximate the slope of tangent lines to a curve. **[C3]**
Find the exact slope of tangent lines to a curve.
Observe how tangent line slopes indicate the direction of a curve. **[C3] [C5]**

Sect. 2.6: Relate rates of change to real-life situations. **[C4]**

Sect. 3.1 – 3.2: Find absolute and local extrema.
Understand the definition of a critical number.
Emphasize continuity and interval notation. **[C4]**
Connect instantaneous rates of change to average rates of change. **[C3] [C4]**

Sect. 3.3 – 3.4: Relate change in slope sign to critical number occurrences. **[C3] [C5]**
Relate concavity to critical number occurrences. **[C3] [C5]**
Be able to justify maxima and minima occurrences. **[C4]**

Sect. 3.5: Find limits at infinity analytically, numerically, and graphically. **[C3]**

Sect. 3.6: Tie Calculus concepts of continuity, differentiability, increasing/decreasing, concavity, extrema, and vertical/horizontal asymptotes to previously learned Algebra concepts such as symmetry, domain/range, and intercepts in order to sketch a function. **[C3]**
Verify and explain results using a graphing utility. **[C5]**

Sect. 3.7: Apply finding extrema to real-life situations. **[C4]**

Sect. 3.9: Use linear approximations to relate and find differentials. **[C3]**
Use mental math to calculate differentials. **[C3]**

Sect. 4.1: Answer "What is an antiderivative?"
Use graphing calculators to demonstrate various particular solutions. **[C5]**

Sect. 4.2 – 4.3: Use rectangles to approximate area between a curve and the x-axis. **[C3]**

Sect. 4.4 – 4.5: Understand and be able to apply the Fundamental Theorem of Calculus.
Apply the Average and Mean Value Theorems for Integrals. **[C3]**
Integrate using Change of Variables and substitution.

Sect. 4.6: Use trapezoids to approximate area between a curve and the x-axis. **[C3]**

Sect. 5.1 – 5.2: Relate the natural logarithmic function, its derivative, and its integral to real-life situations. **[C3] [C4]**

Sect. 5.3: Observe the relationship of inverse functions using a graphing utility. **[C5]**
Find inverse and the derivative of an inverse function. **[C3]**

Sect. 5.4 – 5.5: Sketch graphs the inverse functions ln x and e^x using shifts. **[C3] [C5]**
Calculate and apply derivatives and integrals of logarithmic functions. **[C4]**

Sect. 5.6 – 5.7: Integrate and differentiate inverse trigonometric functions.

Sect. 6.1: Sketch the general solution of a differential equation using slope fields. **[C5]**
Sketch the particular solution of a differential equation. **[C5]**

Sect. 6.2 – 6.3: Solve differential equations by Separation of Variables.
Solve homogeneous differential equations.
Apply differential equations to exponential growth and decay. **[C4]**

Sect. 7.1: Relate the representative rectangle to the area between two curves.
View the integral as an accumulating function. **[C3]**
Apply the Fundamental Theorem of Calculus to find the area between two curves.

Sect. 7.2 – 7.3: Practice picturing revolving a function around an axis. **[C3] [C5]**
Accumulate disks and shells to find volume of a solid of revolution. **[C5]**
Relate the formula for the disk and shell methods to adding up areas of rectangles. **[C3]**
Adjust the formula to allow for a non-zero axis of rotation.
Find the volume of a figure with non-circular cross-sections. **[C5]**

Sect. 7.4: Calculate arc length of a curve.
Relate arc length to distance traveled and other real-life situations. **[C4]**
Calculate the surface area of a revolved figure.
Describe how surfaces of revolution are used in real-life. **[C4]**

Sect. 8.1 – 8.2: Summarize integration techniques.
Apply integration by parts.
Understand and communicate the need for integration by parts. **[C3] [C4]**
Shortcut integration by parts using the tabular method and explain why. **[C4]**

Sect. 8.3 – 8.4: Evaluate trigonometric integrals.
Use trigonometric substitutions from Geometry. **[C4]**

Sect. 8.6 – 8.7: Understand and apply indeterminate form.
Review using a table to approximate limits. **[C3]**
Use L'Hôpital's Rule to find limits at infinity. **[C5]**

STUDENT INFORMATION

Students should calculate grades regularly by using the information listed below. Each student should keep a personal record of his/her scores on each assignment, test, quiz, and project.

Work Ethic	10%
Homework:	25%
Quizzes:	15%
Tests & Projects:	50%
Final Exam:	20% (of overall semester average)

Dual Credit Option

If receiving 4 college credits for this course through IPFW, the student's final letter grade for the year in this course will also be recorded on his/her college transcript. Applications for this dual credit option are due by **August 22, 2014**.
If a student chooses this option, but later decides to drop the class, the student should consult the IPFW student handbook for the drop schedule percent refund correlation.
In order to officially drop the course through IPFW, the student *must* call the Collegiate Connection office at (260) 481-5478.

Evaluation

Homework: Practice is extremely important in any math class, including Calculus! Students should attempt every problem, neatly show all work, and feel free to ask questions *before* class to receive credit for the assignment. Homework assignments will be given daily and are essential for excellent comprehension of the course curriculum. Students should keep in mind that homework assignments are designed for *their* practice. Students are welcome (and encouraged) to do more problems than what is assigned. Students will present homework questions to their classmates on the board occasionally **[C4]**. So be ready!

Quizzes: The quiz category includes not only announced comprehensive quizzes, which may be given mid-chapter, but also unannounced, sporadic quizzes.

Tests/Projects: A test will generally be given at the end of each chapter. Calculators will sometimes not be allowed on tests or on certain sections of tests **[C5]**. All tests will be similarly formatted to the AP Exam. Tests will include multiple choice and free response questions, similar to ones found on past AP Exams. Test questions will be worded similarly and of the same difficult content as the AP Exam. Tests will be graded like the AP Exam. Projects may be given as appropriate to extend learning within a topic. Students may only recover scores in this category (see the recovery policy below for further details).

AP Exam: Except foreign exchange students, the AP Calculus AB Exam will be taken by all students in this course on the morning of Tuesday, May 5, 2015 from 8 AM until 12 PM. The exam will be administered in the high school, but in a different classroom. This will not be averaged into the student's final grade for the course, but if scoring high enough, the AP

only student may receive college credit. The AP Exam score does not jeopardize the college credit paid for through IPFW.

Classroom Expectations

All school policies and rules printed in the student agenda will be automatic guidelines for the classroom. However, in general, students are expected to come to class prepared to learn.

- Students are expected to **study** Calculus. The textbook provided to use in class is the main resource required, but if while studying independently or in groups, students have questions the current textbook does not thoroughly answer, students are encouraged to use other textbooks and the Internet. I have various Calculus textbooks available for student use. I have studied intensely for what you will need to know **[C1]**, and I expect you to put forth a similar effort toward learning what you need to know.
- Students need to **participate** in classroom activities such as taking notes, asking questions, correcting homework, and participating in group activities **[C4]**. Each student needs to bring the appropriate materials, including a pencil, paper, calculator, 3-ring binder, and the textbook.
- Students are expected to learn appropriate vocabulary and **communicate** effectively both verbally and in written form with classmates and the teacher in solving problems **[C4]**.
- A **graphing calculator** is needed for this course and should students wish to purchase their own, the TI-84 is a popular model. However, a classroom set of TI-89 graphing calculators are available for individual use during this course **[C5]**. The graphing calculator will be used on several homework problems and test questions **[C3]**.
- Each student will also be expected to **conduct** himself/herself in a manner that is conducive to learning and not detracting in any way from others' ability to learn. All students are expected to treat the teachers and fellow students with high respect and consideration.

Make-up Work Policy

Attendance is very important. Excessive absences will likely prevent students from successfully completing this course. It is solely the student's responsibility to make contact with the teacher to initiate all make-up work. I encourage you to obtain at least two phone numbers of other classmates who can be contacted for make-up work or assistance with assignments. Please review the policy stated in your student agenda.

Because homework, class lectures, and in-class activities are essential to a student's full understanding of this material, attendance is vital. However, if a student must be absent, only students with excused absences will be allowed to make up any work for credit. All absent students are responsible for understanding the material missed. **Students with an excused absence may turn in work up to the same number of days absent after he/she returns to class. It is the student's responsibility to turn in work for credit within the permitted time limit.** After that time has lapsed, the excused student may not make up the work for credit. If a student has a pre-arranged absence, he or she may request the assignments ahead of time. I will do my best to make sure that student doesn't fall behind if he or she puts forth the effort. **As school policy states, after six days of absence, a letter from the office will be sent home. After ten days of absence, a student will be reviewed by the No Credit**

committee to determine whether a student will not receive credit for the semester or be put on probationary status.

Tardy Policy

Arriving to class on time is just as important as attendance to class. My definition of tardy is not **in your seat by the time the bell rings**. The school-wide tardy policy is as follows:

1st and 2nd tardies: Verbal warning
3rd and 4th tardies: Referral resulting in an office detention
5th tardy: Referral resulting in one day of ISS/Wednesday night school
6th tardy: Referral resulting in one day of ISS/Wednesday night school
7th tardy: Referral resulting in one day of OSS
8th and 9th tardies: Referral resulting in three days of OSS
10th tardy: Referral resulting in review by the No Credit committee

I reserve the privilege to amend this syllabus throughout the year.

I LOOK FORWARD TO A GREAT YEAR WITH YOU!!!

I have read and understand the course syllabus that outlines the classroom policy, rules, grading procedure, and recovery policy. I understand that it is the student's responsibility to keep their parents abreast of their most current average. I also understand that extra help is available to all students assuming diligent effort is put forth on a daily basis.

Course: _____

Period: _____

Student Last Name: _____ First Name: _____

Parent/Guardian Name _____ Relationship _____

Home Phone _____ Other Phone_____

Work Phone _____ E-mail _____

Parent/Guardian Name _____ Relationship _____

Home Phone _____ Other Phone_____

Work Phone _____ E-mail _____

Student Signature: _____

Parent Signature: _____

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