PURDUE UNIVERSITY FORT WAYNE

MA 16500 Course Syllabus

Course Title: Analytic Geometry and Calculus I

Course Number: MA 16500

Instructor Name:

Instructor Email:

Office Hours: M-F 7:15-8:00 a.m.

Office Location: Rm 351

Course Description:

Introduction to differential and integral calculus of one variable, with applications. Conic sections.

Course Prerequisites:

MA 15400 with a grade of C- or higher or placement by departmental exam or permission of the instructor.

Course Access:

This course uses Schoology for online resources. Schoology.accs.k12.in.us

Course Goals:

This course is designed to develop your ability to interpret and employ limits, derivatives, and integrals to model real-world phenomena, analyze the behavior of functions, and solve applied problems. Through this process, you will strengthen your problem-solving skills, think critically, and prepare for continued study in mathematics, science, and engineering.

Indiana College Core Area 3 Quantitative Reasoning Competencies

3.1. Interpret information that has been presented in mathematical form*.

3.2. Represent information/data in mathematical form* as appropriate
    *mathematical form = functions, equations, graphs, diagrams, tables, words, and geometric figures.

3.3. Demonstrate skill in carrying out mathematical (e.g. algebraic, geometric, logical, statistical) procedures flexibly, accurately, and efficiently to solve problems.

3.4. Analyze mathematical arguments, determining whether stated conclusions can be inferred.

3.5. Communicate which assumptions have been made in the solution process.

3.6. Analyze mathematical results in order to determine the reasonableness of the solution.

3.7. Cite the limitations of the process where applicable. Communication

3.8. Clearly explain the representation, solution, and interpretation of the math problem.

Limits and Continuity: Students should understand limits from multiple perspectives (graphically, numerically, algebraically and verbally) and be able to evaluate limits at points or at infinity. Students should also understand the concept of continuity, be able to determine where a function is continuous or discontinuous, and be able to apply continuity theorems.

Derivatives: Students should understand derivatives from multiple perspectives (geometrically, numerically and analytically). They should be able to find the derivatives of algebraic, trigonometric, and exponential functions using the limit definition of derivative. They should be able find the derivatives of sums, differences, products, quotients, and compositions of functions using derivative formulas. They should know when and how to apply the techniques of implicit and logarithmic differentiation. They should be able to find the derivatives of exponential functions, trigonometric functions, logarithms, and other inverse functions.

Applications of Differentiation: Students should learn how to determine the extreme values of functions and how to investigate the shape of curves using the derivative. They learn how to use the theory to solve applied optimization problems. They use Newton's Method, and learn the basic properties of antiderivatives.

Integrals: Students should know and understand the definition of the definite integral using Riemann sums. They should understand the relationship between the definite integral and area; understand and use the basic properties of the definite and indefinite integral and the Fundamental Theorem of Calculus.

In addition to the above, see also the Indiana Academic Mathematics Standards for Calculus listed here.

Learning Resources & Texts

- **Required Textbook:** Anton, Bivens. *Calculus. AP Edition 11th Edition*. 2015

Assignments

Students will complete homework assignments, quizzes, and tests. Quizzes are generally given halfway through each chapter, and tests are given at the end of chapters.

Homework assignments:
1.1 p.10: 1, 3-5, 7, 9, 17-21, 23
1.2 p.20: 1-31 all, 37
1.3 p.28: 1, 3, 5, 9-31 odds, 39, 43
1.5 p.48: 1-4, 7, 11-19 odds, 29, 31, 35
1.6 p.54: 1-7 odds, 11-29 odds

2.1 p.87: 1, 4, 15-18, 23
2.2 p.97: 1, 3, 4, 7, 15, 17, 23, 25, 27-33 all
2.3 p.106: 1-15 odds, 16, 17, 19, 29, 31, 39, 41, 43, 51
2.4 p.112: 5-13 odds, 27
2.5 p.116: 1-19 odds, 25
2.6 p.123: 5, 7-43 Every Other Odd, 51, 75

3.1 p.133: 3-17 odds, 29
1.8 p.72: 1, 5, 9-29 odds
3.2 p.138: 1-25 odds, 35-41 odds
3.3a p.144: 1, 2, 5, 15-25 odds skip #19, 31-41 odds
1.7 and 3.3b p.61: 5, 7-9, 15, then p.145: 43-53 odds, 65

3.4 p.150: 1, 3, 7-9, 11, 12, 14, 17, 19, 20, 25, 30, 32, 33, 39
3.5 p.158: 5-9 odds, 23, 25
3.6 p.167: 7-33 odds

4.1 p.180: 1-9 odds, 15-19 odds, 27, 33, 39
4.2 p.190: 1, 3, 19-31 odds, 37, 41, 43, 44, 45, 63
4.4 p.210: 1, 3, 4, 7-15 odds, 21, 23, 25
4.5 p.221: 1, 3, 6, 8, 9, 21-23, 31, 32
4.6 p.231: 1-4, 9-12, 15, 17, 19
4.8 p.245: 1-7 odds, 11, 12, 41

5.4 p.283
Part 1 p.283: 1, 11-17 odds
Part 2 p.284: 27, then p.257: 1-7 odds. Use $n = 10, 50, 100$ for both LRAM and RRAM = 6 answers per problem
Part 3 p.284: 35, 37, 39
5.5 p.292: 1, 5-9 all, 13-23 odds
5.2 p.265: 5, 7, 15-35 odds, 43, 47, 49
5.3 p.275: 15-55 odds
5.6 p.303: 5-9 odds, 13-29 Every Other Odd, 31, 49, 50, 59, 61, 63, 69
5.7 p.312: 1, 4, 5, 9, 11, 13, 32, 35, 36a, 37
5.8 p.317: 1-9 odds
5.9 p.322: 1, 19, 21, 31-45 odds, 49

6.1 p.347: 1-13 odds, 19, 21, 35, 36
6.2 p.355: 1-11 odds, 19, 21, 31, 45-49 odds

8.2 p.494: 1-7 odds, 11, 13, 29-35 odds
8.3 p.502: 1-3, 6

Grading Scale:

A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

Your grades will be weighted, and grades come from the following:

Homework	10% of your total grade, about 10 points per section.
Quizzes	30% of your total grade, about 20-30 points each
Tests	60% of your total grade, 100 points each.

The final exam is worth 20% of the course grade.

Course Evaluation:

Students will be provided a link through Schoology at the end of the course. This link will be to a form created and managed by the Collegiate Connection office. All data collected is anonymous and will be shared with instructors and their departments at the end of the school year.

Academic Misconduct / Plagiarism / AI:

Academic Misconduct, including plagiarism (using other people's ideas/words and not giving them credit thus implying the work is your own original work) or using your own work from a previous course without the express permission of the instructor, is taken very seriously at any learning institution. It is taken very seriously in this class. Please be aware of what behaviors constitute academic misconduct (See Bulletin, Code of Students Rights, Responsibilities and Conduct Part II. A.) If caught cheating or plagiarizing, a student may receive no credit on the assignment and may result in an F for the course. Any instances of academic dishonesty will be reported to the Office of Student Conduct and Care and your Department Chair and may result in expulsion from the University. Additional potential consequences can be found under: potential consequences (See Bulletin, Code of Students Rights, Responsibilities and Conduct, Part III. A.: i.e., failure of the assignment, failure of the course and/or dismissal from the university) of such behavior.

Student Support Services

Purdue University Fort Wayne is committed to your academic and personal success. Visit the Student Support Services page for a list of student support services, including academic services, technology services, health and wellness, and support from administrative offices. For help with technology, including Brightspace, visit the IT Services Student Technology Support page.

If you observe and/or are made aware of student behavior that leaves you feeling concerned, worried, and/or alarmed, trust your instincts and say something. The CARE Team can assist with the student of concern, whether that's you or someone you are referring. Report the concern through the online CARE referral form. Please note that this form is not for emergencies. If you know of a student who is injured, is injuring themselves or others, or is threatening injuries to themselves or others, please call 911 immediately.

Your emotional wellness and mental health are important. If you have a mental health disorder, are struggling with your mental health, your stress overwhelms your ability to cope with it, or you find yourself needing emotional support, please talk to someone. If you or someone you know is in a mental health crisis situation, call 911 or go to the local emergency room. Otherwise, please reach out to our Center for Student Counseling (CSC). All currently enrolled PFW and IUFW students have access to free counseling at the center. To make an appointment to talk with a counselor call 260-481-6200 or email csc@pfw.edu.

Course Schedule

    I.   **Semester One**
- A. **Chapter P**
  - a. **Models and graphs**
  - b. **Linear Models and Rates of change**
  - c. **Functions and their graphs**
  - d. **Review of Trigonometric Functions**
- B. **Chapter 1: Limits and Continuity**
  - 1. **Limits Graphically and Numerically**

    a. **This is done by making a table of values on the calculator as x approaches that point from the left and from the right.**
  2. **Limits Analytically**
  3. **Continuity and One-sided limits**
  4. **Infinite Limits**

 C. **Chapter 2: Differentiation**
  1. **Tangent lines and velocity**
  2. **The derivative**
  3. **The power rule**
  4. **The product and quotient rules**
  5. **The chain rule**
  6. **Derivatives of Trigonometric functions**
  7. **Implicit differentiation**
  8. **Related Rates**

 D. **Chapter 3: Applications of Differentiation**
  1. **Maximum and minimum values**
  2. **Increasing and decreasing functions**
  3. **The Mean Value Theorem**
  4. **Concavity and the second derivative**
  5. **Limits involving infinity**
  6. **Optimization**

 E. **Chapter 4: Integration**
  1. **Antiderivatives**
  2. **Sums and sigma notation**
  3. **Area**
  4. **The definite integral**
  5. **The Fundamental Theorem of Calculus**
  6. **Integration by substitution**
  7. **Numerical integration**

Semester One Final

II. **Semester Two**

 A. **Chapter 5: Exponentials, Logarithms, and other transcendental functions**
  1. **The Natural logarithm**
  2. **Inverse functions**
  3. **The exponential function**
  4. **The inverse trigonometric functions**
  5. **Indeterminate forms and L'Hopital's rule**

 A. **Chapter 6: Differential Equations**
  1. **Separable differential equations**
  2. **Direction fields**

B. **Chapter 7: Applications of Integration**
1. **Area between curves**
2. **Volume: Slicing, disks, and washers**
3. **Volumes of cylindrical shells**
4. **Arc length and surface area**
5. **Projectile motion**

C. **Chapter 8: Integration Techniques**
1. **Trigonometric techniques of integration**
2. **Tabular Integration**

D. **AP review and practice exams**

AP Exam (May)

E. **Chapter 7, 8**
1. **Integration by parts**
2. **Integration using partial fractions**
3. **Integration odd/even power trigonometric**
4. **Systems of first-order differential equations**

Semester Two Final