

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics & Statistics**  
**Math 106 Syllabus, Term 201**  
**Coordinator: Dr. Kareem Elgindy**  
**Office: 5-415 – Email: kareem.elgindy@kfupm.edu.sa**

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**The Course Code and Name:** Math 106, Applied Calculus.

**The Course Credit Hours:** 3-0-3 (Three lecture sessions per week.)

**Instructors:** Dr. Mohammad Z. Abu-Sbeih and Dr. Kareem Elgindy.

**The Course Description:** The derivative. Rules for differentiation. Derivative of logarithmic, exponential, and trigonometric functions. Differentials. Growth and decay models. Definite and indefinite integrals. Techniques of integration. Integrals involving logarithmic, exponential, and trigonometric functions. Integration by tables. Area under a curve and between curves. Functions of several variables. Partial derivatives and their applications to optimization.

**The Course Prerequisite:** One-year preparatory mathematics or its equivalent.

**Learning Outcomes:** After completion of the course, the student should be able to:

1. Calculate limits graphically, numerically, and symbolically.
2. Distinguish between continuous and discontinuous functions, and to find points of discontinuity for a function.
3. Interpret the derivative as an instantaneous rate of change.
4. Differentiate functions using the power rule, product rule, quotient rule, chain rule, implicit differentiation, and logarithmic differentiation.
5. Differentiate exponential functions, trigonometric functions, and logarithmic functions.
6. Find higher-order derivatives both directly and implicitly.
7. Compute partial derivatives and higher-order partial derivatives.
8. Find the relative and absolute extrema, and the inflection points using differentiation.
9. Test a function for concavity and inflection points.
10. Determine horizontal and vertical asymptotes for a curve.
11. Sketch curves using information obtained from the asymptotes and first and second derivatives.
12. Solve optimization problems and problems involving exponential growth and decay using the concept of differentiation of a function of one variable.
13. Define the differential, interpret it geometrically, and use it in approximations.
14. Integrate various types of functions and understand the relationship between the derivative and the integral of a function.
15. Use the Fundamental Theorem of Calculus to compute definite integrals.
16. Find the area of a region bounded by curves using integration.
17. Find the relative extrema and critical points of a function of two variables and use them to solve several optimization problems.
18. Apply differentiation and integration techniques to solve various applications in business and economics.

**Textbook:** Haeussler, Ernest F., Richard S. Paul, and Richard J. Wood. *Introductory Mathematical Analysis for Business, Economics, and the Life and Social Sciences* (13th edition). Upper Saddle River, NJ: Pearson Prentice Hall, 2011.

Table 1: Tentative Online Classes Pacing Schedule (Subject to Change)

Week	Dates	Sections	Topics	Suggested Problems
1	Aug. 30-Sep. 03	10.1-10.3	Limits - Limits (Continued) - Continuity	<b>PROBLEMS 10.1:</b> 4, 8, 17, 23, 36, 42, 44 <b>PROBLEMS 10.2:</b> 2, 13, 15, 21, 29, 41, 47, 52, 58 <b>PROBLEMS 10.3:</b> 6, 11, 22, 30, 36
2	Sep. 06-10	11.1-11.3	The Derivative - Rules for Differentiation - The Derivative as a Rate of Change	<b>PROBLEMS 11.1:</b> 12, 15, 18, 20, 25, 27 <b>PROBLEMS 11.2:</b> 22, 33, 60, 72, 78, 85 <b>PROBLEMS 11.3:</b> 8, 10, 12, 16, 21, 27, 40, 41
3	Sep. 13-17	11.4, 11.5	The Product Rule and the Quotient Rule - The Chain Rule	<b>PROBLEMS 11.4:</b> 9, 15, 28, 37, 57, 66 <b>PROBLEMS 11.5:</b> 6, 13, 30, 41, 71, 73
4	Sep. 20-24	12.1, 12.2	Derivatives of Logarithmic Functions - Derivatives of Exponential Functions	<b>PROBLEMS 12.1:</b> 16, 18, 20, 24, 28, 30, 32, 50 <b>PROBLEMS 12.2:</b> 10, 14, 16, 22, 28, 30, 38,39
<b>National Day Holidays: Wednesday &amp; Thursday, Sep. 23-24, 2020</b>				
5	Sep. 27-Oct. 01	12.4, 12.5	Implicit Differentiation - Logarithmic Differentiation	<b>PROBLEMS 12.4:</b> 10, 14, 20, 22, 30, 34 <b>PROBLEMS 12.5:</b> 7, 10, 14, 18, 20, 27
<b>Online Assessment 1: Thursday Oct. 01; Material: Sections 10.1-12.2</b>				
6	Oct. 04-08	12.7, 13.1	Higher-Order Derivatives - Relative Extrema	<b>PROBLEMS 12.7:</b> 2, 8, 14, 30, 33, 35 <b>PROBLEMS 13.1:</b> 16, 18, 30, 38, 48, 52
7	Oct. 11-15	13.2, 13.3	Absolute Extrema on a Closed Interval - Concavity	<b>PROBLEMS 13.2:</b> 2, 6, 10, 12 <b>PROBLEMS 13.3:</b> 12, 28, 40, 42, 60, 68
8	Oct. 18-22	13.4, 13.5	The Second-Derivative Test – Asymptotes	<b>PROBLEMS 13.4:</b> 5, 6, 8, 10, 12 <b>PROBLEMS 13.5:</b> 14, 20, 22, 34, 35, 45
<b>Online Midterm Exam: Thursday Oct. 22; Material: Sections 12.4-13.3</b>				
9	Oct. 25-29	13.6, 14.1	Applied Maxima and Minima - Differentials	<b>PROBLEMS 13.6:</b> 4, 15, 18, 22, 26 <b>PROBLEMS 14.1:</b> 12, 14, 20, 22, 29
10	Nov. 01-05	14.2, 14.3	The Indefinite Integral - Integration with Initial Conditions	<b>PROBLEMS 14.2:</b> 8, 10, 18, 27, 30, 45 <b>PROBLEMS 14.3:</b> 5, 7, 11, 14, 15
<b>Online Assessment 2: Thursday Nov. 05; Material: Sections 13.4-14.1</b>				
11	Nov. 08-12	14.4, 14.5	More Integration Formulas - Techniques of Integration	<b>PROBLEMS 14.4:</b> 9, 12, 15, 33, 35, 52 <b>PROBLEMS 14.5:</b> 6, 12, 23, 30, 40, 44, 53,63

12	Nov. 15-19	14.7, 14.9	The Fundamental Theorem of Integral Calculus - Area between Curves	<b>PROBLEMS 14.7:</b> 16, 36, 42, 44, 48 <b>PROBLEMS 14.9:</b> 1, 3, 5, 20, 33, 37, 46, 58
13	Nov. 22-26	15.1, 15.2	Integration by Parts - Integration by Partial Fractions	<b>PROBLEMS 15.1:</b> 6, 8, 12, 18, 20, 24, 32 <b>PROBLEMS 15.2:</b> 1, 5, 6, 7, 8, 17, 31
14	Nov. 29-Dec. 03	15.3, 17.1	Integration by Tables - Partial Derivatives	<b>PROBLEMS 15.3:</b> 3, 7, 9, 14, 20, 36, 44, 54 <b>PROBLEMS 17.1:</b> 2, 8, 18, 20, 24, 30, 35
15	Dec. 06-10	17.4, 17.6	Higher-Order Partial Derivatives - Maxima and Minima for Functions of Two Variables	<b>PROBLEMS 17.4:</b> 6, 8, 12, 18, 20, 21, 23 <b>PROBLEMS 17.6:</b> 4, 9, 17, 19, 22, 26, 29
<b>Normal Thursday Class: Thursday, Dec. 14, 2020</b>				
<b>Online Final Exam: To Be Held During Dec. 16-28; Material: Comprehensive</b>				

**Table 2: The Course Grading Policy**

<b>Online Assessment 1 (MCQ)</b>	15% (45 points)	<ul style="list-style-type: none"> <li>➤ The questions of all assessments, quizzes, and exams are based on the examples and exercises of the Textbook.</li> <li>➤ The online quizzes consist of 5 quizzes, each worth 15 points (5%).</li> <li>➤ The average total grade of the 5 quizzes of each section shall be in the interval [52.5, 56.25], i.e., [70%, 75%] of 75 points.</li> </ul>
<b>Online Midterm Exam (MCQ)</b>	15% (45 points)	
<b>Online Assessment 2 (MCQ)</b>	15% (45 points)	
<b>Online Quizzes (MCQ)</b>	25% (75 points)	
<b>Attendance</b>	5% (15 points)	
<b>Online Final Exam (comprehensive MCQ)</b>	25% (75 points)	
<b>Course Passing Grade</b>	A student must score at least 50% (150/300) to pass the course.	
<b>Upgrade Policy</b>	The upgrade policy is applied when 3 points are needed to get the next higher grade. For instance, the passing grade D starts at 150/300. If a student gets 149/300 or 148/300, then his grade will automatically upgrade to D. However, if a student gets 147/300, his grade will upgrade to D only if his final exam score is greater than or equal to 50% of the Final Exam grade, i.e., 60/120.	

**Cheating in Exams:** Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in an “F” grade in the course along with reporting the incident to the higher university administration. Cheating in exams includes, but not limited to:

- Screen sharing to another computer.
- Using unauthorized advanced electronic devices.
- Keeping notes on smartphones and using mobile apps.
- Faking identities to get third-party assistance.

**Missing an Online Assessment, Quiz, or an Exam:**

- **Assessments, Quizzes, and Midterm Exam:** No make-up test will be given under any circumstances. If a student misses one of these tests for a legitimate reason (such as medical emergencies), he must present an official excuse from the Student Affairs to the designated instructor no later than a week before the date of the Final Exam. In this case the student grade for this test will be the average of all

other tests grades he received in the course during the term, except for the Final Exam grade. If no such official excuse is forwarded to the instructor on time, the student receives ZERO grade.

- **Final Exam:** If a student misses the Final Exam for a legitimate reason (such as medical emergencies), he will be given a make-up Final Exam.

**Attendance:** Students are expected to attend all online classes.

- If a student misses a class, he is responsible for any announcement made in that class.
- A student is considered absent if not attending the online class 10 minutes after the class start time. The instructor may also randomly verify attendance during each online class using any appropriate means he finds. In both cases, the student is permitted to attend the remainder of the online class session.
- A student, who has a valid excuse for an absence, must present an officially authorized document to his instructor no later than a week before the date of the Final Exam; no excuses shall be accepted after that date.
- A DN grade will be awarded to any student who accumulates
  - 9 unexcused absences in online classes.
  - 12 excused and unexcused absences in online classes.

**Usage of Calculators:** Calculators are not allowed in all exams.

**Usage of Communication Devices:** Please turn off your video and mute your microphone when you are not talking unless you have a permission from the instructor to do so. Use a headset when possible. If you own headphones with a microphone, please use them as this improves audio quality. Be in a quiet place when possible. Use the chat window for questions and comments that are relevant to class.

**Academic Integrity:** All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin on the webpage of the Registrar.

**Tips on How to Enhance Your Problem-Solving Skills:**

- Make sure you understand the concepts and techniques of each section.
- Take notes during online classes and study your notes, textbook, and, if available, lecture slides before your next class.
- Review the recorded lecture to consolidate your learning and locate any missed points.
- Try always to solve the problems on your own first before reading the solution or asking for help.
- If you find it difficult to solve a certain type of problems, you should try more problems of that type.
- Try to make good use of the online office hours of your instructor.
- Solve old exams as part of your preparation for the Midterm and Final Exams.
- Last, but not least, consult your instructor whenever you feel you need help understanding a concept or solving a problem.