**King Fahd University of Petroleum and Minerals**

**Department of Mathematics**

**Math 106 Syllabus, Term 251 (2025-2026)**

Coordinator: Dr. Khalid Alshammari (kshamari@kfupm.edu.sa)

**Course Code and Title:** MATH-106, Calculus for Business.

**Course Credit Hours:** 3–0–3 (Three lecture hours per week)

**Textbook:** Introductory Mathematical Analysis for Business, Economics, and the Life and Social Sciences by Haeussler, Ernest F., Richard S. Paul, and Richard J. Wood (13th edition) Pearson, 2014

**Course Objective:**

1. To introduce students to the basic concepts of the derivative of functions of one variable and its applications to business.
2. To introduce students to the concept of integration and its applications.
3. To introduce students to the concept of partial derivatives of functions of several variables and its applications to optimization.

**Course Description:** Limits and continuity. The derivative and rules for differentiation of various types of functions. Differentials. Implicit and logarithmic differentiation. Applications to optimization and curve sketching. Definite and indefinite integrals. Techniques of integration. Integration by tables. Area under a curve and between curves. Functions of several variables. Partial derivatives and their applications to optimization.

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

**Course Learning Outcomes:** Upon successful completion of the course, a student should be able to

1. Compute the derivatives of various types of functions of one variable.
2. Determine the relative and absolute extrema and inflection points of a function of one variable.
3. Evaluate the integral of some algebraic and trigonometric functions.
4. Compute area between curves.
5. Calculate partial derivatives of functions of several variables and find the extreme values of functions of two variables.
6. Apply the concepts and techniques of calculus to solve problems in business and economics.

## Grading Policy:

| Exam I (15 MCQ) | Date: October 00 | Time: TBA | Place: TBA | 25% (75 points) |
|---|---|---|---|---|
| | Material: Sec. 10.1–12.4 | | | |
| Exam II (15 MCQ) | Date: November 00 | Time: TBA | Place: TBA | 25% (75 points) |
| | Material: Sec. 12.5–14.3 | | | |
| Final Exam (21 MCQ) | Date: TBA | Time: TBA | Place: TBA | 35% (105 points) |
| | Material: Comprehensive | | | |
| Class Work | ➢ It is based on quizzes, class tests, attendance, or other class activities determined by the instructor. ➢ The average (out of 45) of the class work of each section has to be in the interval $[y-1, y+1]$, where $$y = \frac{9}{40}\left(median\ Ex1\% + median\ Ex2\%\right)$$ | | | 15% (45 points) |
| | | | TOTAL | 100% (300 points) |

**Letter Grades:** The letter grades will follow a grading curve, which depends on the average of all students enrolled in the course.

**Exam Questions:** The questions of the exams are similar to the examples and exercises in the textbook.

**Cheating in Exams:** Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of DN in the course along with reporting the incident to the higher university administration for further action. Cheating in exams includes (but is not restricted to):

➢ Looking at the papers of other
   students. Talking to other students.
➢ Using mobiles, smart watches, or any other electronic devices.
➢ Using ChatGPT or any AI source.

**Other Exam Issues:**

> ➢ No student will be allowed to take the exam if he/she does not bring his/her KFUPM ID, or National/Iqama ID, or Driver's License with him/her to the exam hall.
> ➢ Students are not allowed to have their mobiles, smart watches, or any electronic device in the exam hall. A violation of this will be considered an attempt of cheating.
> ➢ A student must sit in the seat assigned to him/her. A violation of this will be considered an attempt of cheating.

**Missing an Exam:** In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get a score of zero in the missed exam.

**Attendance:** Students are expected to attend all lectures and lab classes.

> ➢ If a student misses a class/lab, he/she is responsible for any announcement made in that class/lab.
> ➢ After warned **twice** by the instructor, a DN grade will be awarded to any student who accumulates:
>   - 9 unexcused absences. (20%)
>   - 15 excused and unexcused absences. (33%)

**The Usage of Mobiles in Class:** Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must get permission from their instructor. Violations of these rules will result in a penalty decided by the instructor.

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

## Coverage Plan

| Week | Dates (2024) | Section | Topics (32 sections) |
|---|---|---|---|
| 1 | Aug. 24-28 | | An Introductory class: Course Content, Grading Policy,… |
| | | **10.1** | Limits |
| | | **10.2** | Limits (Continued) |
| 2 | Aug. 31-Sep. 04 | **10.3** | Continuity |
| | | **11.1** | The Derivative |
| | | **11.2** | Rules for differentiation |
| 3 | Sep. 07-11 | **11.3** | The derivative as a rate of change |
| | | **11.4** | Product & quotient rule |
| 4 | Sep. 14-18 | **11.5** | The chain rule & the power rule |
| | | **12.1** | Derivative of logarithmic functions |
| | | **12.2** | Derivative of exponential functions |
| **Tuesday, September 23: National Day Holiday** | | |
| 5 | Sep. 21-25 | **12.4** | Implicit differentiation |
| 6 | Sep. 28- Oct. 2 | **12.5** | Logarithmic differentiation (Expressing the percentage rate of change in revenue in terms of the percentage rate of change in price using the elasticity of demand is beyond the scope of the course, since Section 12.3 is not included.) |
| | | **12.7** | Higher order derivative |
| **Exam I: Date (October 00); Time (TBA); Material: (10.1–12.4)** | | |
| 7 | Oct. 05-09 | **13.1** | Relative extrema |
| | | **13.2** | Absolute extrema on a closed interval |
| | | **13.3** | Concavity |
| 8 | Oct. 12-16 | **13.4** | The second derivative test |
| | | **13.5** | Asymptotes |
| 9 | Oct. 19-23 | **13.6** | Applied maxima and minima |
| | | **14.1** | Differentials |
| **October 26-30: Midterm Break** | | |
| 10 | Nov. 02-06 | **14.2** | The indefinite integral |
| | | **14.3** | Integration with initial conditions |
| 11 | Nov. 09-13 | **14.4** | More integration formulas |
| | | **14.5** | Techniques of integration |
| **Exam II: Date (November 00); Time (TBA); Material: (12.5–14.3)** | | |
| 12 | Nov. 16-20 | **14.7** | Fundamental theorem of calculus |
| | | **14.9** | Area between curves |
| 13 | Nov. 23-27 | **HO** | Handouts: Differentiation and Integration of Trigonometric Functions |
| | | **15.1** | Integration by parts |
| 14 | Nov. 30-Dec. 04 | **15.3** | Integration by tables |
| | | **17.1** | Partial derivatives |
| 15 | Dec. 7-11 | **17.4** | Higher order partial derivatives |
| | | **17.6** | Maxima and minima |
| 16 | Dec. 14 | | A Normal Tuesday Class (**Review/ Catching up**) |
| **Final Exam (MCQ): Comprehensive** | | |

## Suggested Practice Exercises

| Sr. | Sec | Exercises # |
|---|---|---|
| 1 | 10.1 | 4, 8, 17, 23, 36, 42, 44 |
| 2 | 10.2 | 2, 13, 15, 21, 29, 41, 47, 52, 58 |
| 3 | 10.3 | 6, 11, 22, 30, 36 |
| 4 | 11.1 | 12, 15, 18, 20, 25, 27 |
| 5 | 11.2 | 22, 33, 60, 72, 78, 85 |
| 6 | 11.3 | 8, 10, 12, 16, 21, 27, 40, 41 |
| 7 | 11.4 | 9, 15, 28, 37, 57, 66 |
| 8 | 11.5 | 6, 13, 30, 41, 71, 73 |
| 9 | 12.1 | 16, 18, 20, 24, 28, 30, 32, 50 |
| 10 | 12.2 | 10, 14, 16, 22, 28, 30, 38, 39 |
| 11 | 12.4 | 10, 14, 20, 22, 30, 34 |
| 12 | 12.5 | 7, 10, 14, 18, 20, 27 |
| 13 | 12.7 | 2, 8, 14, 30, 33, 35 |
| 14 | 13.1 | 16, 18, 30, 38, 48, 52 |
| 15 | 13.2 | 2, 6, 10, 12 |
| 16 | 13.3 | 12, 28, 40, 42, 60, 68 |
| 17 | 13.4 | 5, 6, 8, 10, 12 |
| 18 | 13.5 | 14, 20, 22, 34, 35, 45 |
| 19 | 13.6 | 4, 15, 18, 22, 26 |
| 20 | 14.1 | 12, 14, 20, 22, 29 |
| 21 | 14.2 | 8, 10, 18, 27, 30, 45 |
| 22 | 14.3 | 5, 7, 11, 14, 15 |
| 23 | 14.4 | 9, 12, 15, 33, 35, 52 |
| 24 | 14.5 | 6, 12, 23, 30, 40, 44, 53, 63 |
| 25 | 14.7 | 16, 36, 42, 44, 48 |
| 26 | 14.9 | 1, 3, 5, 20, 33, 37, 46, 58 |
| 27 | 15.1 | 6, 8, 12, 18, 20, 24, 32 |
| 28 | 15.2 | 1, 5, 6, 7, 8, 17, 31 |
| 29 | 15.3 | 3, 7, 9, 14, 20, 36, 44, 54 |
| 30 | 17.1 | 2, 8, 18, 20, 24, 30, 35 |
| 31 | 17.4 | 6, 8, 12, 18, 20, 21, 23 |
| 32 | 17.6 | 4, 9, 17, 19, 22, 26, 29 |

**Some tips to enhance your problem-solving skills:**

◆ ◆ Practice (but not memorize) more problems than those given in the above list.

◆ Solve some review exercises available at the end of each chapter.

◆ Solve the problems on your own before reading the solution or asking for help.

◆ If you find it difficult to handle a certain type of problem, you should try more problems of the same type.

◆ Try to make good use of the office hours of your instructor. Always bring your solution trials to discuss them with your instructor.