**King Fahd University of Petroleum and Minerals**
**Department of Mathematics & Statistics**
**Math 101 – Syllabus (Term 161)**
**Coordinator: Dr. Bader Al Humaidi**

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**Title**: Calculus I

**Credit**: 4-0-4

**Textbook**: Calculus (Early Transcendental) by J. Stewart, 8th edition, Brooks/Cole, 2012.

**Description**: To introduce the student to the basic concepts and methods of Calculus, topics include:

- Limits, continuity and differentiability of functions of a single variable (exponential, logarithmic, trigonometric and inverse trigonometric functions.)
- Applications: related rates, local linear approximation, differentials, hyperbolic functions, curve sketching and applied optimization problems.

**Learning Outcome:**

Upon successful completion of this course, a student should be able to:

1. Compute various types of limits of functions.
2. Apply the precise definition of a limit to some simple functions.
3. Determine the region of continuity and types of discontinuity of a function.
4. Apply the intermediate value theorem to locate zeros of functions.
5. Compute the slope of a curve at a point and the rate at which a function changes.
6. Calculate derivatives of different types of functions (exponential, logarithmic, trigonometric and inverse trigonometric functions) by using derivative rules.
7. Use differentials to estimate errors.
8. Differentiate the hyperbolic functions.
9. Find extreme values of functions.
10. Sketch and analyze the graphs of various types of functions.
11. Apply Newton's method to approximate zeros of functions.
12. Solve single variable optimization problems using derivatives.
13. Recover some basic functions from their derivatives.

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## Grading Policy:

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|---|---|---|
| **1. Exam I**<br>A common written exam | **Material:** (2.1-2.8)<br>**Date**: October 4, 2016<br>**Time: 5:45 – 7:15 PM**<br>**Place: TBA** | 25%<br>(100 points) |
| **2. Exam II**<br>A common multiple choice exam | **Material:** (3.1-3.9)<br>**Date**: December 4, 2016<br>**Time: 5:45 – 7:45 PM**<br>**Place: TBA** | 25%<br>(100 points) |
| **3. Final Exam**<br>A comprehensive common multiple choice exam | **Material:** (Comprehensive)<br>**Date**: **January 18, 2017**<br>**Time: 8 AM**<br>**Place: TBA** | 35%<br>(140 points) |
| **4. Class Work** | **i) Online Homework:** The web address for online homework is: https://www.webassign.net. | 5%<br>(20 points) |
| | **ii) Class Activities:** They are based on quizzes, class tests, or other class activities determined by the instructor. Any quiz or test under class activity should be of written type and not of multiple-choice type. The average x (out of 40) of class activities of the sections taught by the same instructor should be in the interval [28, 30]. | 10%<br>(40 points) |

**Exam Questions**:

The questions of the common exams are based on the examples, homework problems, recitation problems and the exercises of the textbook.

**Missing Exam I or Exam II:**

No makeup exam will be given under any circumstance. When a student misses Exam I or Exam II for a legitimate reason (such as medical emergencies), his grade for this exam will be determined based on the existing formula, which depends on his performance in the non-missing exam and in the final exam.

**Attendance:**

Attendance is a University Requirement. A DN grade will be awarded to any student who accumulates 12 unexcused absences (lecture and recitation).

**Academic Integrity:** All KFUPM policies regarding ethics apply to this course.

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| Week | Dates | Sec. | Topics |
|---|---|---|---|
| 1 | Sep. 18 – 21 | 2.1 | The Tangent Problem (Example 1). |
| | | 2.2 | The Limit of a Function. |
| **Sep. 22 (National Holiday)** | | | |
| 2 | Sep. 25 – 29 | 2.3 | Calculating Limits Using the Limit Laws |
| | | 2.4 | The Precise Definition of a Limit **(Examples 1, 2 and 3)** |
| 3 | Oct. 2 – 6 | 2.5 | Continuity |
| 4 | Oct. 9– 13 | 2.6 | Limits at Infinity; Horizontal Asymptotes |
| | | 2.7 | Derivative and Rates of Change |
| 5 | Oct. 16 – 20 | 2.8 | The Derivative as a Function + **Exercise # 56** |
| | | 3.1 | Derivatives of Polynomials and Exponential Functions |
| **Exam I: October 23, 2016 (2.1- 2.8)** | | | |
| 6 | Oct. 23 – 27 | 3.2 | The Product and Quotient Rules |
| | | 3.3 | Derivatives of Trigonometric Functions |
| 7 | Oct. 30 – Nov. 3 | 3.4 | The Chain Rule |
| | | 3.5 | Implicit Differentiation + **Exercise # 77** |
| 8 | Nov. 06 – 10 | 3.6 | Derivatives of Logarithmic Functions |
| | | 3.7 | Rates of Change **(Example 1)** |
| **Nov. 13 – 17 Midterm Break** | | | |
| 9 | Nov. 20 – 24 | 3.9 | Related Rates |
| | | 3.10 | Linear Approximations and Differentials |
| 10 | Nov. 27 – Dec.1 | 3.10 | Continued |
| | | 3.11 | Hyperbolic Functions (**Examples: 1 and 2**) |
| **Exam II: December 4, 2016 (3.1- 3.10)** | | | |
| 11 | Dec. 4 – 8 | 4.1 | Maximum and Minimum Values |
| | | 4.2 | The Mean Value Theorem |
| 12 | Dec. 11 – 15 | 4.2 | The Mean Value Theorem |
| | | 4.3 | How Derivatives Affect the Shape of a Graph |
| 13 | Dec. 18 – 22 | 4.4 | Indeterminate Forms and L'Hospital's Rule |
| | | 4.5 | Summary of Curve Sketching |
| 14 | Dec. 25 – 29 | 4.5 | Continued |
| | | 4.7 | Optimization Problems |
| 15 | Jan. 1 – 5 | 4.8 | Newton's Method |
| | | 4.9 | Antiderivatives |
| 16 | Jan. 8 | | Review ( **Normal Thursday Classes**) |
| **Final Exam: May 17, 2016 (Comprehensive)** | | | |

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Homework & Recitation Problems

| Section | Homework Problems | Recitation Problems | CAS* |
|---|---|---|---|
| 2.2 | 2, 6, 9, 11, 15, 32, 35 | 5, 16, 34, 36 | - |
| 2.3 | 2, 5, 9, 18, 22, 39, 46, 50, 53, 60 | 10, 15, 29, 40, 51, 57 | - |
| 2.4 | 2, 3, 16, 20 | 1, 4, 18, 19 | - |
| 2.5 | 4, 12, 16, 21, 29, 38, 43, 46, 49(a, c), 53 | 3, 14, 22, 32, 49(b), 52 | 34 |
| 2.6 | 4, 9, 21, 23, 26, 35, 38, 44, 49, 60 | 3, 7, 24, 43, 62 | - |
| 2.7 | 3, 10(a, b), 15, 23, 29(a), 32, 38, 44 | 11, 12, 17, 22, 38 | - |
| 2.8 | 4, 26, 32, 50, 53, 56, 64 | 3, 12, 51, 57, 61 | 32 |
| 3.1 | 10, 22, 30, 37, 46, 55, 62, 63, 66(b), 74, 77 | 23, 32, 50(a, b), 72, 81 | 48 |
| 3.2 | 10, 23, 28, 32, 44(b, c), 50(b), 61, 64 | 19, 30, 49, 52(c) | 39 |
| 3.3 | 4, 16, 18, 22, 30, 33, 41, 50, 57 | 19, 31, 42, 45 | - |
| 3.4 | **1**7, 22, 37, 46, 50, 53, 61, 73, 77 | 65, 76, 78 | - |
| 3.5 | 10, 19, 28, 35, 50, 58, 77 | 36, 51, 75, 78 | - |
| 3.6 | 4, 13, 16, 22, 25, 30, 32, 40, 48, 52, 55 | 14, 34, 43, 54 | - |
| 3.7 | 1, 7 | 4, 5 | - |
| 3.9 | 4, 12,13, 14, 17, 24, 47 | 5, 9, 21 | - |
| 3.10 | 4, 9, 11(b), 16, 20, 24, 34 | 2, 10, 25, 35 | 5 |
| 3.11 | 3(a), 4(b), 10, 13, 19, 20, 23(a, e), 31, 38 | 1(b), 4(a), 17, 21, 37 | - |
| 4.1 | 4, 8, 9, 22, 33, 39, 40, 50, 68(b) | 14, 28, 44, 76 | - |
| 4.2 | 7, 10, 12, 14, 19, 26 | 5, 9, 18, 22, 32 | - |
| 4.3 | 2, 6, 8, 14, 16, 20, 27, 37, 46, 47 | 31, 44, 51, 52 | 60 |
| 4.4 | 2, 4, 11, 24, 32, 35, 41, 50, 51, 63, 68 | 14, 34, 46, 55, 57 | - |
| 4.5 | 6, 9, 28, 36, 39, 50, 62, 68 | 16, 38, 71, 74 | - |
| 4.7 | 8, 13, 16, 21, 31, 32, 37, 43, 54 | 14, 29, 50, 56 | - |
| 4.8 | 2, 6, 8, 12 | 1, 7, 11 | - |
| 4.9 | 5, 18, 34, 37, 42, 46, 48, 63 | 14, 17, 38, 52, 64 | - |

*** CAS** problems require the use of a technology tool (e.g., graphing calculators or a computer). You are encouraged to do these problems in order to enhance your understanding of the concepts involved.

**Tips on how to enhance your problem-solving abilities:**

1. Please do all the homework assignments on time.
2. You are urged to practice (but not memorize) more problems than the above lists.
3. You should always try to solve a problem on your own before reading the solution or asking for help.
4. If you find it difficult to handle a certain type of problems, you should try more problems of that type.
5. You should try the recitation problems before coming to class.
6. You are encouraged to solve some of the review problems at the end of each chapter.
7. The practice you get doing homework and reviewing the class lectures and recitations will make exam problems easier to tackle.
8. Try to make good use of the office hours of your instructor.