BUTTE COLLEGE
COURSE OUTLINE

I. **CATALOG DESCRIPTION**

MATH 30 - Analytic Geometry and Calculus I **5 Unit(s)**

Prerequisite(s): MATH 20 and MATH 26 or college-level pre-calculus
Recommended Prep: Four years of high school college-preparatory Mathematics and Reading Level IV
Transfer Status: CSU/UC
85 hours Lecture

A first course in differential and integral calculus of a single variable: functions, limits and continuity, techniques and applications of differentiation and integration, Fundamental Theorem of Calculus. Primarily for Science, Technology, Engineering & Math Majors. (C-ID MATH 210).

II. **OBJECTIVES**

Upon successful completion of this course, the student will be able to:

A. Compute the limit of a function at a real number.
B. Determine if a function is continuous at a real number.
C. Find the derivative of a function as a limit.
D. Find the equation of a tangent line to a function.
E. Compute derivatives using differentiation formulas.
F. Use differentiation to solve applications such as related rate problems and optimization problems.
G. Use implicit differentiation.
H. Graph functions using methods of calculus.
I. Evaluate a definite integral as a limit.
J. Evaluate integrals using the Fundamental Theorem of Calculus.
K. Apply integration to find area.

III. **COURSE CONTENT**

A. **Unit Titles/Suggested Time Schedule**

Lecture

Topics	Hours
1. Definition and computation of limits using numerical, graphical, and algebraic approaches	8.00
2. Continuity and differentiability of functions	3.00
3. Derivative as a limit	2.00
4. Interpretation of the derivative as slope of tangent line and a rate of change	6.00
5. Differentiation formulas: constant rule, power rule, product rule, quotient rule, and chain rule	6.00
6. Derivatives of transcendental functions such as trigonometic, exponential, or logarithmic	8.00
7. Implicit differentiation with applications, and differentiation of inverse functions	4.00
8. Higher-order derivatives	2.00
9. Graphing functions using first and second derivatives, concavity, and asymptotes	5.00

10. Maximum and minimum values, and optimization	10.00
11. Mean Value Theorem	1.00
12. Antiderivatives and Indefinite Integrals	6.00
13. Area under a curve	6.00
14. Definite Integral and Riemann Sum	3.00
15. Properties of the Integral	3.00
16. Fundamental Theorem of Calculus	4.00
17. Integration by substitution	6.00
18. Indeterminate forms and L'Hopital's Rule	2.00
Total Hours	85.00

IV. METHODS OF INSTRUCTION

A. Lecture
B. Collaborative Group Work
C. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
D. Discussion
E. Board Work

V. METHODS OF EVALUATION

A. Exams/Tests
B. Quizzes
C. Class Assignments and Class Response
D. Daily Homework Assignments, where the student will demonstrate problem-solving skills

VI. EXAMPLES OF ASSIGNMENTS

A. Reading Assignments
   1. Read the section in the textbook on The Derivative and be able to set up and evaluate the limit that represents the derivative of a given function.
   2. Read the section in the textbook on Antiderivatives and Indefinite Integration and be able to use basic integration rules to find an indefinite integral.

B. Writing Assignments
   1. Graph the functions y = x, y= |x|, and y = x^(1/3), compute the derivatives of each function at the point (0,0), and describe the differentiability of these functions at this point. Assume you are explaining this to a group of students hearing this for the first time and write a detailed explanation discussing your results and why they occurred.
   2. If p(x) is a polynomial function, explain why p(x) has exactly one antiderivative whose graph contains the origin. Assume you are explaining this to a classmate having trouble and write a detailed explanation using a general polynomial as well as giving one specific example.

C. Out-of-Class Assignments
   1. Review the section in the textbook on Basic Differentiation and solve the problems assigned by the instructor, showing all steps.
   2. Review the section in the textbook on The Fundamental Theorem of Calculus and solve the problems assigned by the instructor, showing each step.

VII. RECOMMENDED MATERIALS OF INSTRUCTION

Textbooks:

A. Larson, R. & Edwards, B.H. Calculus of a Single Variable. 9th Edition. Brooks/Cole Cengage Learning, 2010.

Materials Other Than Textbooks:

A. Scientific Calculator or graphing calculator without symbolic algebra capabilities

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