

SYLLABUS

COURSE # & TITLE: MATH 188, Calculus I

OF CREDITS: 4 (3+2P)

CATALOG DESCRIPTION:

Instructs the student in the methods of differential calculus. Topics include elementary algebraic and transcendental functions, limits, continuity, differentiations and optimization. Other topics include L’hopital’s rule, Newton’s method, Riemann sums, indefinite & definite integration, and the fundamental theorem of calculus. Mathematical software will be utilized throughout the course to expose students to computer algebra systems.

Semester Offered: Fall, Spring, Summer

Prerequisites: Grade of “C” or better in Math 185; College Algebra and Math 180; Trigonometry

Common Student Learning Outcomes

Upon successful completion of San Juan College programs and degrees, the student will....

Learn *Students will actively and independently acquire, apply and adapt skills and knowledge to develop expertise and a broader understanding of the world as lifelong learners.*

Think *Students will think analytically and creatively to explore ideas, make connections, draw conclusions, and solve problems.*

Communicate *Students will exchange ideas and information with clarity and originality in multiple contexts.*

Integrate *Students will demonstrate proficiency in the use of technologies in the broadest sense related to their field of study.*

Act *Students will act purposefully, reflectively, and respectfully in diverse and complex environments.*

GENERAL LEARNING OUTCOMES:

Upon completion of the course, the student should understand the following content areas:

- 1.) Functions and their representations.
- 2.) The Derivative.
- 3.) Techniques of Differentiation.
- 4.) Application of the Derivatives.
- 5.) The Definite & Indefinite Integral.
- 6.) Numerical Interpretations.
- 7.) Emphasis on Theories & Theorems.

OUTCOMES:

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

- 1.1 Good foundation of defining, recognizing and interpreting a Function.
- 1.2 Represent the following functions algebraically, graphically and numerically
 - Linear
 - Power
 - Inverse
 - Trigonometric

- Exponential
 - Logarithmic
- 1.3 Recognize the types of problems that are modeled by the functions in 1.2
 - 1.4 Explain the effect of varying parameters on the graphs of the functions in 1.2
 - 1.5 Interpret the different definitions and formulas of the functions in 1.2
 - 1.6 Recognize the functional notation, domain & range of a function and the composition of functions in 1.2
 - 1.7 Understand the criteria for the existence of an inverse function, graph of an inverse function and inverse trigonometric functions and identities.
 - 1.8 Describe the relationships between exponential and logarithmic functions.
- 2.1 Give a general description or definition of Calculus.
 - 2.2 Describe the intuitive notion of limits by graphing and tables.
 - 2.3 Recognize the existence or nonexistence of limits, the formal definition of a limit of a function.
 - 2.4 Understand the Basic Properties & Rules for Limits
 - 2.5 Algebraic methods to compute and find limits, also piecewise-defined functions.
 - 2.6 Interpret the concept of Continuity/Discontinuity, involving the Intermediate Value Theorem.
- 3.1 Identify tangent lines, slope of a tangent line of a graph at a point.
 - 3.2 Compute the Difference Quotient.
 - 3.3 Know the concepts of the Derivative and recognize the graphical representation of the derivative.
 - 3.4 Utilize the derivative of Constant, Power functions and the properties involved. Along with higher derivatives.
 - 3.5 Recognize the relationship between the graph of a function and the graph of its derivative.
 - 3.6 Identify the derivatives of the sine, the cosine, and other trigonometric functions.
 - 3.7 Identify the derivatives of Exponential and Logarithmic functions.
 - 3.8 Recognize and distinguish between Average & Instantaneous Rate of Change.
 - 3.9 Understand the Chain Rule and justification of the Chain Rule.
 - 3.10 Know the general procedure for Implicit Functions.
 - 3.11 Model application problems involving rates of change.
 - 3.12 Interpret results achieved by Local Linearization or Tangent Line Approximation & Differentials.
- 4.1 Describe the following concepts and their relationship to the first and second derivatives:
 - Maxima and Minima
 - Concavity
 - Inflection Points
 - 4.2 Use the first and second derivative tests to find the relative and local extrema.
 - 4.3 Find the absolute extrema of a function on an interval.
 - 4.4 Describe the Mean Value Theorem and Rolle's Theorem.
 - 4.5 Recognize curves: limits involving Infinity and Asymptotes.
 - 4.6 Model various Optimization applications
 - Physical Science
 - Engineering
 - Business
 - Economics
 - Life Sciences
 - 4.7 Use l'Hopital's Rule and identify Indeterminate forms.
- 5.1 Recognize Reverse Differentiation, Anti-derivative notation, Anti-differentiation formulas.
 - 5.2 Describe the area as a limit of a sum.
 - 5.3 Compute Right-Hand and Left-Hand Riemann Sums.
 - 5.4 Know when the Riemann sum is an overestimate and an underestimate of areas.
 - 5.5 Use the Fundamental Theorem of Calculus to evaluate definite integrals.

- 5.6 Use the Second Fundamental Theorem of Calculus.
- 5.7 Compute anti-derivatives and Indefinite Integrals.
- 5.8 Know how to use the Substitution Method of integration for definite and indefinite integrals.
- 5.9 Use the Mean Value Theorem for Integrals; Average Value.
- 5.10 Compute and recognize Numerical Integration: The Trapezoidal & Simpson's Rule.
- 5.11 Use the Natural Logarithm as an integral.

- 6.1 Use technology to aid in the solution of calculus problems.
- 6.2 use a computer algebra system to make calculations and graph functions.
- 6.3 Describe the limitation of technology in finding the exact solution.

OTHER REQUIREMENTS:

The TI-82, TI-83, TI-84, TI-85 or TI-86 graphing calculator is required for the course. A **TI-83 Plus or TI-84 Plus Graphing Calculator** is strongly recommended. Graphing calculators capable of symbolic manipulation (such as TI-89 or TI-92 and other such calculators) will not be allowed on examinations, the final exam and where the instructor finds fit.

Dean, School of Science: _____

Frank Williams

Date: 5/2/06

A current syllabus must be on file in the dean's office for every course being taught during a given semester.