

SYLLABUS AND CONTENTS OF MATH 101 (1444)

Course Name: Differential Calculus

Credit Hours: 3 hours

Course Number: Math 101

Actual Hours: 6.15 hours

Prerequisite: -----

Textbook: Differential Calculus, Fourth Edition, 2019

Authors:

Ibraheem Alolyan, Nasser Bin Turki, Tahsin Ghazal, Obaid Al-Gahtani and Khaled Khashan

References:

- Swokowski, E, W; Olinick, M; Penece, D. Calculus, Sixth Edition, PWS Publishing Company, 1994.
- Larson, R & Edwards, R. **Calculus**, Tenth Edition, Cengage Learning, 2014.
- Anton, H; Bivens, I & Davis, S. **Calculus Early Transcendentals**, Ninth Edition, Wily & Sons, 2009.

CONTENTS:

Functions: set of Numbers and Inequalities, Functions: Basic Definitions and Examples, Properties of functions, and their combination, Inverse functions, Trigonometric functions, Inverse Trigonometric functions.

Limits and Continuity: Definition of Limit, Limits Laws, Limits Involving Infinity, Continuity of Functions.

Differentiation: The Derivative and the Tangent Line Problem, Differentiation Rules, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Higher Order Derivatives, The Derivative of Inverse Functions.

Applications of Differentiation: Extrema of Functions, The Mean Value Theorem, Increasing and Decreasing Functions, Concavity, Curve Sketching, Optimization Problems, Related Rates.

GOALS

In this course the student will:

- Define functions and their types.
- Define and apply the properties of limits of functions.
- State the definition of continuity and determine where a function is continuous or discontinuous.
- Find the derivative of an algebraic function by using the definition of a derivative.
- Apply differentiation rules to find the derivative of algebraic, trigonometric, exponential, and logarithmic functions and their inverses.
- Apply differentiation rules to find the derivative of the sum, product, quotient, inverse, and composite (chain rule) of elementary functions.
- Find the derivative of an implicitly defined function.
- Find the higher order derivatives of algebraic, trigonometric, exponential, and logarithmic functions.
- Use logarithmic differentiation as a technique to differentiate non-logarithmic functions.
- State and prove the Mean Value Theorem for derivatives and apply it algebraically and graphically.
- Use the derivative to find critical numbers, increasing intervals, decreasing intervals, local extrema, absolute extrema, concavity intervals and inflection points.
- Apply the derivative to solve problems, including tangent and normal lines to a curve, curve sketching, velocity, acceleration, related rates of change, and optimization problems.