

# CALCULUS

## CONCEPT/UNIT OUTLINE

### UNIT ONE: Algebra Review of Expressions, Equations, & Functions

- 1 Simplify expressions with exponents and with radicals
- 2 Simplify expressions using the four basic operations
- 3 Solve various equations of a single variable
- 4 Graph an equation using x and y intercepts, symmetry, and other points
- 5 Write and graph linear equations in slope-intercept form
- 6 Solve systems of equations algebraically
- 7 Determine the domain and range of functions
- 8 Evaluate functions and create compositions of functions
- 9 Use technology to find various aspects of an equation and its graph
- 10 Use technology to discover mathematical models

### UNIT TWO: Limit Properties

- 11 Find the slope of the tangent line (rate of change) via the limit process
- 12 Find the area under a curve via the limit process
- 13 Find the length of a curve via the limit process
- 14 Find limits using numerical methods such as a table of values
- 15 Find limits by using graphs
- 16 Find limits using the analytical method of substitution
- 17 Find the limit of a function using other analytical methods such as cancellation and rationalization
- 18 Find limits with the position function
- 19 Determine the place and type of discontinuities in a function
- 20 Determine one-sided, infinite, and two-sided limits

### UNIT THREE: Derivatives

- 21 Differentiate by the limit process
- 22 Graph the first derivative given the graph of a function
- 23 Use the basic power rule to differentiate
- 24 Differentiate the position function to find various velocity types and acceleration
- 25 Differentiate with the product rule
- 26 Differentiate with the quotient rule
- 27 Derive trigonometric functions
- 28 Find multiple derivatives
- 29 Use the chain rule to find the derivative
- 30 Apply implicit differentiation theory with other rules used to derive
- 31 Set up and solve rate-related applications using derivatives

### UNIT FOUR: Applications of the Derivative

- 32 Find critical numbers and absolute extrema of a function on a given interval
- 33 Apply the Extreme Value and Rolle's Theorems to a function
- 34 Find the intervals where a function is increasing or decreasing
- 35 Determine the relative extrema of a function
- 36 Use technology to find key elements of a function
- 37 Find the intervals where a function is concave up or concave down and determine points of inflection
- 38 Graph elements of a function
- 39 Optimize a function and do error analysis using differentiation ideas

### UNIT FIVE: Integrals

- 40 Integrate a function
- 41 Utilize summation formulas and write summations from a series
- 42 Use the exhaustion method and Riemann Sums to determine the area under a curve
- 43 Evaluate integrals using given information
- 44 Apply the Fundamental Theorem of Calculus
- 45 Use the Mean Value Theorem and determine the average value of a function
- 46 Integrate a function with u-substitution
- 47 Apply other rules (Simpson's & Trapezoidal) to find the area under a curve

### UNIT SIX: Logarithmic, Exponential, & Other Functions

- 48 Utilize logarithmic rules
- 49 Differentiate using various rules with logarithms
- 50 Use logarithmic differentiation as an alternative tool to discover the rate of change
- 51 Integrate logarithms using various techniques
- 52 Determine the inverse of a function and its properties
- 53 Solve, derive, and integrate natural logarithmic and exponential functions
- 54 Solve, derive, and integrate logarithmic and exponential functions with bases other than 'e'
- 55 Solve growth and decay problems.
- 56 Verify and find solutions to differential equations
- 57 Derive and integrate transcendental functions

### UNIT SEVEN: Applications of Integration

- 58 Calculate the area between curves
- 59 Determine volume using various methods of a solid of revolution
- 60 Evaluate arc length and surface area of a solid of revolution using integration formulas