MATH M25AH: Honors – Calculus with Analytic Geometry I

Course Objectives (COR)

- Evaluate the limit of a function using numerical and algebraic techniques, the properties of limits, and analysis techniques. Honors: **Construct a formal proof (using e-d) for the existence of limit of a function.**
- Evaluate one-sided and two-sided limits for algebraic and trigonometric functions.
- Determine analytically whether a limit fails to exist.
- Determine whether a function is continuous or discontinuous at a point.
- Apply the Intermediate Value Theorem to a continuous function on a closed interval. Honors: **Verify the conditions under which the theorem is applicable.**
- Use the formal definition of the derivative to find the derivative of algebraic functions Honors: **and trigonometric functions.**
- Apply the basic rules of differentiation to find the derivative of a function including the constant, power, sum, product, quotient, and Chain rules. Honors: **Derive the rules of differentiation for algebraic and trigonometric functions.**
- Find first-order and higher-order derivatives of algebraic and transcendental functions and their inverses.
- Find the derivatives of functions and relations using implicit differentiation.
- Solve applied problems using the derivative including rates of change, the tangent line problem, and related rates.
- Apply the method of logarithmic differentiation for finding derivatives.
- Demonstrate an understanding of the connection between differentiability and continuity of a function.
- Apply Rolle's Theorem and the Mean Value Theorem to a function on a closed interval. Honors: **Verify the applicability of the theorems.**
- Identify indeterminate forms and use L'Hospital's Rule to evaluate limits.
- Apply analytic techniques to a function and its derivatives to solve curve sketching problems, Honors: **for both algebraic and transcendental functions.**
- Use differentials with linear approximation problems Honors: **and error analysis, and apply to real-life projects.**
- Solve applied optimization problems. Honors: **Apply optimization techniques to real-life problems and projects.**
- Find an approximate solution to an equation using Newton's Method, Honors: **including error analysis**.
- Apply the basic rules of integration for finding anti-derivatives for algebraic and transcendental functions. Honors: **Apply the rules to physics and other types of problems.**
- Use summation notation with Riemann sums and upper and lower sums.
- Use the formal definition of the definite integral to evaluate the integral of an algebraic function over a closed interval.

- Evaluate definite integrals using the properties of integrals and the Fundamental Theorem of Calculus.
  Honors: **Demonstrate a proof of the Fundamental Theorem of Calculus**
- Integrate indefinite and definite integrals using change of variable techniques.
- Use integration and analysis techniques to find the area of a region between two curves.

Course Learning Outcomes (CLO)

- Students completing this course will be able to find one-sided and two-sided limits.
- Students completing this course will be able to apply differentiation techniques to graphing, optimization or related rates problems.
- Students completing this course will be able to apply integration techniques to finding area.