Math 150
Challenge Exam Information
Mathematics Department
San Diego Miramar College

Do not attempt the Math 150 Challenge Exam unless you are confident that you can successfully answer questions regarding the following topics.

- Evaluate various types of limits graphically, numerically, and algebraically, and analyze properties of functions applying limits including one-sided, two-sided, finite and infinite limits.

- Develop a rigorous limit proof for simple polynomials.

- Recognize and evaluate limits using the common limit theorems and properties.

- Analyze the behavior of algebraic and transcendental functions by applying common continuity theorems, and investigate the continuity of such functions at a point, on an open or closed interval.

- Calculate the derivative of a function using the limit definition.

- Calculate the slope and the equation of the tangent line of a function at a given point.

- Calculate derivatives using common differentiation theorems.

- Calculate the derivative of a function implicitly.

- Solve applications using related rates of change.

- Apply differentials to make linear approximations and analyze propagated errors.

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- Apply derivatives to graph functions by calculating the critical points, the points of non-differentiability, the points of inflections, the vertical tangents, cusps or corners, and the extrema of a function.

- Calculate where a function is increasing, or decreasing, concave up or concave down by applying its first and second derivatives respectively, and apply the First and Second Derivative Tests to calculate and identify the function's relative extrema.

- Solve optimization problems using differentiation techniques.

- Recognize and apply Rolle's Theorem and the Mean-Value Theorem where appropriate.

- Apply Newton's method to find roots of functions.

- Analyze motion of a particle along a straight line.

- Calculate the anti-derivative of a wide class of functions, using substitution techniques when appropriate.

- Apply appropriate approximation techniques to find areas under a curve using summation notation.

- Calculate the definite integral using the limit of a Riemann sum and the Fundamental Theorem of Calculus and apply the Fundamental Theorem of Calculus to investigate a broad class of functions.

- Apply integration in a variety of application problems, including areas between curves, arc lengths of a single variable function, volumes

- Estimate the value of a definite integral using standard numerical integration techniques which may include the Left-Endpoint Rule, the Right-Endpoint Rule, the Midpoint Rule, the Trapezoidal Rule, or Simpson's Rule.

- Calculate derivatives of inverse trigonometric functions, hyperbolic functions and inverse
- hyperbolic functions.

- Calculate integrals of hyperbolic functions, and of functions whose anti-derivatives give inverse trigonometric and inverse hyperbolic functions.