Math 151
Challenge Exam Information
Mathematics Department
San Diego Miramar College

Do not attempt the Math 151 Challenge Exam unless you are confident that you can successfully answer questions regarding the following topics.

- Solve first-order separable differential equations and initial value problems.

- Solve application problems involving first-order separable differential equations, such as exponential growth and decay.

- Solve integral problems by first examining the integral, then selecting and applying the appropriate technique of integration.

- Apply integration to physics problems relating to mass, centers of mass, work, and fluid force.

- Identify, analyze, and evaluate improper integrals.

- Evaluate the limits of functions which have the indeterminate forms "zero/zero" and "infinity/infinity" using L'Hôpital's Rule.

- Transform the other indeterminate forms into those which L'Hôpital's Rule can be implemented.

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- Define an infinite sequence; analyze and assess the monotonicity and convergence of a given sequence.

- Identify some basic series, including the geometric series, harmonic series, and a telescoping sum.

- Compare the different convergence tests, including the Integral Test, the Ratio Test, the Root Test, the Comparison Test, the Limit Comparison Test, the Alternating Series Test, and the Divergence Test.

- Assess the convergence of a series by formulating the comparison of the given series to a known series.

- Assess if an alternating series converges absolutely, converges conditionally, or diverges.

- Analyze a series, assess which convergence tests can be applied in determining its behavior, and apply this test to show the series convergence or divergence.

- Derive the Taylor series of a given function using a variety of techniques.

- Calculate the radius of convergence of a given power series.

- Apply Taylor's Theorem and Taylor polynomials to approximate to a certain degree of accuracy, the values of functions at non-trivial points

- Apply the known power series expansions of important functions to generate the series expansion of other functions.

- Express a given second degree equation in the form of its standard conic equation and sketch the standard conic sections.

- Analyze a conic section by rotating it to a standard position.

- Sketch the graphs of functions in polar coordinates, including cardiods, lemniscates, and limaçons

- Calculate the areas of a polar regions.

- Calculate the arc length of polar curves, and the surface area bounded by polar curves.

- Calculate the equation of tangent lines to polar curves.

- Express a curve with parametric equations.

- Calculate the tangent lines and arc lengths of parameterized curves.