Georgia Mathematics

Calculus

Mathematical Practices

0 Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals. C.MP

- 0.1 Make sense of problems and persevere in solving them. C.MP.1
- 0.2 Reason abstractly and quantitatively. C.MP.2
- 0.3 Construct viable arguments and critique the reasoning of others. C.MP.3
- 0.4 Model with mathematics. C.MP.4
- 0.5 Use appropriate tools strategically. C.MP.5
- 0.6 Attend to precision. C.MP.6
- 0.7 Look for and make use of structure. C.MP.7
- 0.8 Look for and express regularity in repeated reasoning. C.MP.8

Mathematical Modeling

1 Apply mathematics to real-life situations; model real-life phenomena using mathematics. C.MM.1

- 1.1 Explain contextual, mathematical problems using a mathematical model. C.MM.1.1
- 1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. C.MM.1.2
- 1.3 Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. C.MM.1.3
- 1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems. C.MM.1.4

Functional & Graphical Reasoning

2 Apply limit notation and characteristics of continuity to analyze behaviors of functions. C.FGR.2

- 2.1 Estimate limits from graphs and tables of values. C.FGR.2.1
- 2.2 Find limits of sums, differences, products, and quotients using substitution. C.FGR.2.2
- 2.3 Represent asymptotic behavior using limits. C.FGR.2.3
- 2.4 Find limits of rational functions using algebraic techniques. C.FGR.2.4
- 2.5 Demonstrate continuity at a point using the definition and limit notation. C.FGR.2.5
- 2.6 Apply the Intermediate Value Theorem to a function over a closed interval. C.FGR.2.6

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3 Relate limits and continuity to the derivative as a rate of change and apply it to a variety of situations including modeling contexts. C.FGR.3

- 3.1 Interpret the derivative as an instantaneous rate of change that is a two-sided limit of an average rate of change. C.FGR.3.1
- 3.2 Demonstrate and apply the relationship between differentiability and continuity. C.FGR.3.2
- 3.3 Apply the concept of derivative geometrically, numerically, and analytically. C.FGR.3.3
- 3.4 Find the derivatives of sums, products, quotients, and composite functions. C.FGR.3.4
- 3.5 Find the derivatives of a variety of relations. C.FGR.3.5
- 3.6 Calculate higher order derivatives. C.FGR.3.6

4 Apply derivatives to situations in order to draw conclusions including curve analysis and modeling rates of change in applications. C.FGR.4

- 4.1 Calculate the slope of a curve at a point. C.FGR.4.1
- 4.2 Write the equation of the tangent line to a curve at a point and use it to obtain a local linear approximation of a value near the point of tangency. C.FGR.4.2
- 4.3 Identify intervals where functions are increasing, decreasing, and constant by using the relationship between the function and the sign of its first derivative. C.FGR.4.3
- 4.4 Identify points of inflection and intervals of concavity of a function by using the second derivative of a function. C.FGR.4.4
- 4.5 Compare characteristics of f, f', and f" graphically, numerically, analytically, and with technology. C.FGR.4.5
- 4.6 Apply Mean Value Theorem. C.FGR.4.6
- 4.7 Apply Extreme Value Theorem. C.FGR.4.7
- 4.8 Apply the derivative to real-world problems to find both local and absolute extrema, with and without technology. C.FGR.4.8
- 4.9 Model rates of change in applied situations. C.FGR.4.9

Geometric & Spatial Reasoning

5 Analyze the relationship between the derivative and the integral using the Fundamental Theorem of Calculus. C.GSR.5

- 5.1 Use Riemann sums to approximate values of definite integrals. C.GSR.5.1
- 5.2 Interpret a definite integral as a limit of Riemann sums. C.GSR.52
- 5.3 Find the exact value of a definite integral using geometric formulas on a coordinate plane. C.GSR.5.3
- 5.4 Demonstrate the use of properties of definite integrals. C.GSR.5.4
- 5.5 Apply the Fundamental Theorem of Calculus as an interpretation of the accumulation in the rate of change of a function as equivalent to the change in the antiderivative over the interval. C.GSR.5.5
- 5.6 Apply Fundamental Theorem of Calculus to indefinite integrals to represent the family of antiderivatives. C.GSR.5.6
- 5.7 Apply integration by substitution to definite and indefinite integrals. C.GSR.5.7

Patterning & Algebraic Reasoning

6 Apply the definite integral and indefinite integral to contextual situations. C.PAR.6

- 6.1 Find a particular curve in a family of antiderivatives using an initial condition. C.PAR.6.1
- 6.2 Solve separable differential equations and use them to model real-world problems. C.PAR.6.2
- 6.3 Apply definite integrals to find the area between two curves. C.PAR.6.3
- 6.4 Apply definite integrals to find the average value of a function over a closed interval. C.PAR.6.4