Grades 9-12

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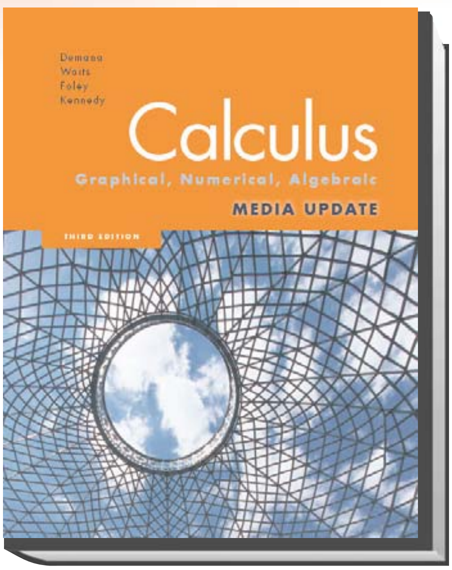

CORRELATED TO

Advanced Placement (AP) Calculus AB Standards

Grades 9-12

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ADVANCED PLACEMENT (AP) CALCULUS AB STANDARDS	PAGE (S) WHERE TAUGHT (If submission is not a text, cite appropriate resource(s))
I Functions, Graphs, and Limits	
Analysis of graphs. With the aid of technology, graphs of functions are often easy to produce. The emphasis is on the interplay between the geometric and analytic information and on the use of calculus both to predict and to explain the observed local and global behavior of a function.	SE/TE: 16, 17, 19, 20, 25, 28, 40, 43–45, 49, 52, 53
Limits of functions (including one–sided limits).	
· An intuitive understanding of the limiting process.	SE/TE: 59, 60, 66, 64, 66, 77
· Calculating limits using algebra.	SE/TE: 62, 63, 66, 76
· Estimating limits from graphs or tables of data.	SE/TE: 63, 64, 66, 67, 68
Asymptotic and unbounded behavior	
· Understanding asymptotes in terms of graphical behavior	SE/TE: 70–71, 73, 76
· Describing asymptotic behavior in terms of limits involving infinity	SE/TE: 73, 76
· Comparing relative magnitudes of functions and their rates of change. (For example, contrasting exponential growth, polynomial growth, and logarithmic growth)	SE/TE: 454, 455, 457, 458
Continuity as a property of functions	
· An intuitive understanding of continuity. (Close values of the domain lead to close values of the range.)	SE/TE: 81, 85
· Understanding continuity in terms of limits	SE/TE: 78, 79, 84, 85
· Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem)	SE/TE: 83, 85, 187, 188, 193
II. Derivatives	
Concept of the derivative	
· Derivative presented graphically, numerically, and analytically	SE/TE: 102–104, 107, 108, 183
· Derivative interpreted as an instantaneous rate of change	SE/TE: 91, 93, 127, 129, 135
· Derivative defined as the limit of the different quotient	SE/TE: 90, 99, 100, 104, 105
· Relationship between differentiability and continuity	SE/TE: 110, 113–115

SE = Student Edition TE = Teacher Edition

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Derivative at a point	
· Slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents.	SE/TE: 90, 92, 93, 118, 124, 182
· Tangent line to a curve at a point and local linear approximation	SE/TE: 233, 234, 242
· Instantaneous rate of change as the limit of average rate of change	SE/TE: 91, 93, 127, 135
· Approximate rate of change from graphs and tables of values	SE/TE: 93, 129, 135
Derivative as a function	
· Corresponding characteristics of graphs of *f* and *f'*	SE/TE: 101, 102, 106, 182, 206, 207
· Relationship between the increasing and decreasing behavior of *f* and the sign of *f'*	SE/TE: 199, 202, 203, 209
· The Mean Value Theorem and its geometric consequences	SE/TE: 196–198, 202, 204
· Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa	SE/TE: 107, 130, 140, 153, 248
Second derivatives	
· Corresponding characteristics of the graphs of *f, f',* and *f"*	SE/TE: 209, 210, 216, 217, 257
· Relationship between the concavity of *f* and the sign of *f"*	SE/TE: 208, 215, 218
· Points of inflection as places where concavity changes	SE/TE: 208, 209, 214, 215, 217
Applications of derivatives	
· Analysis of curves, including the notions of monotonicity and concavity	SE/TE: 199, 202, 203, 209, 210, 214, 217, 260
· Optimization, both absolute (global) and relative (local) extrema	SE/TE: 221, 222, 224–227
· Modeling rates of change, including related rates problems	SE/TE: 247, 249–251
· Use of implicit differentiation to find the derivative of an inverse function.	SE/TE: 167, 170, 174, 178, 184
· Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration	SE/TE: 130–132, 134, 136–139

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· Geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations	SE/TE: 323–325, 328, 330
Computation of derivatives	
· Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions	SE/TE: 143, 144, 146, 170, 173, 178
· Basic rules for the derivative of sums, products, and quotients of functions.	SE/TE: 118, 120, 121, 124
· Chain rule and implicit differentiation	SE/TE: 149, 153, 158, 160, 162
III. Integrals	
Interpretations and properties of definite integrals	
· Computation of Riemann sums using left, right, and midpoint evaluation points	SE/TE: 265, 266, 270–273, 315–317
· Definite integral as a limit of Riemann sums over equal subdivisions	SE/TE: 277, 278, 282, 283, 316
· Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval: $f'(x)dx = f(b) - f(a)$	SE/TE: 149, 153, 158, 162, 160
· Basic properties of definite integrals. (Examples include additivity and linearity.)	SE/TE: 286, 290, 291, 293
Applications of integrals. Appropriate integrals are used in a variety of applications to model physical, biological, or economic situations. Although only a sampling of applications can be included in any specific course, students should be able to adapt their knowledge and techniques to solve other similar application problems. Whatever applications are chosen, the emphasis is on using the integral of a rate up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include finding the area of a region, the volume of a solid with known cross sections, the average value of a function, and the distance traveled by a particle along a line.	SE/TE: 386, 387, 396, 397, 406, 407, 416, 417, 425–427
Fundamental Theorem of Calculus	
· Use of the Fundamental Theorem to evaluate definite integrals	SE/TE: 295, 296, 300, 302, 303

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· Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined.	SE/TE: 297, 300–303
Techniques of antidifferentiation	
· Antiderivatives following directly from derivatives of basic functions	SE/TE: 331, 337, 332, 337
· Antiderivatives by substitution of variables (including change of limits for definite integrals)	SE/TE: 333–338
Applications of antidifferentiation	
· Finding specific antiderivatives using initial conditions, including applications to motion along a line	SE/TE: 321, 322, 327, 379–383, 386
· Solving separable differential equations and using them in modeling. In particular, studying the equation $y' = ky$ and exponential growth.	SE/TE: 350, 354, 355–358
Numerical approximation to definite integrals. Use of Riemann and trapezoid sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.	SE/TE: 278, 283, 307, 308, 312, 313