National
ADVANCED PLACEMENT*

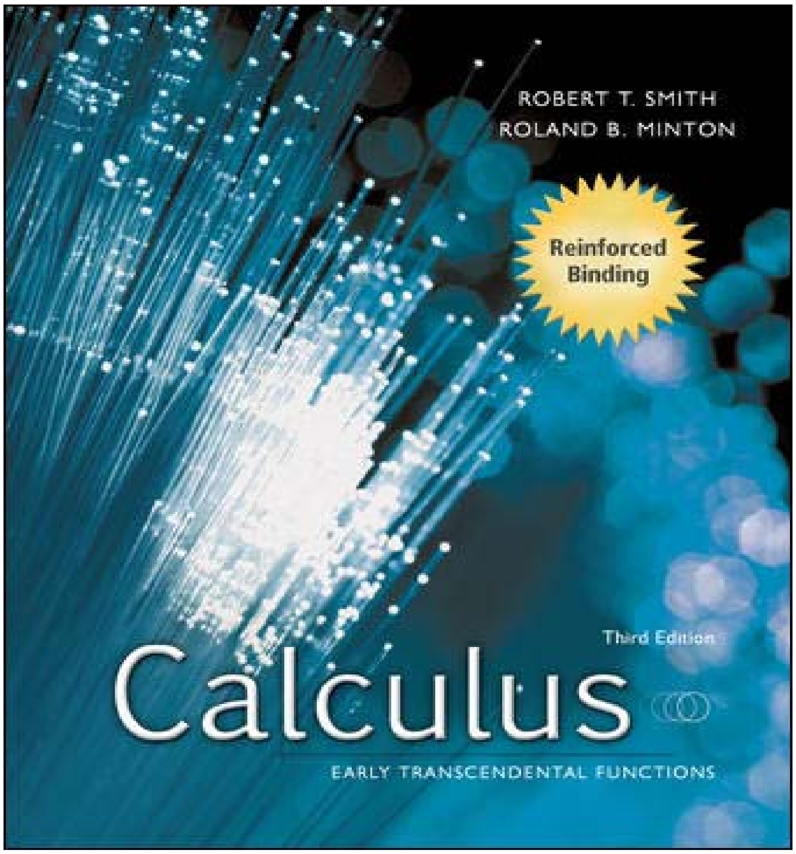
CORRELATION GUIDE

to accompany

Smith and Minton

Calculus: Early Transcendental Functions

3rd Edition



Based on College Board Curriculum Guide:

Calculus AB & BC
May 2006, May 2007

CORRELATION

Subject: AP Calculus AB & BC
Title: *Calculus: Early Transcendental Functions 3e*
Author: Smith and Minton
Edition: 3
Publishers: McGraw-Hill
Text ISBN: 007327657X

			Topic	Pages
Part 1: AP Calculus AB				
1			**Functions, Graphs, and Limits**	
	1		**Analysis of graphs**	
		1	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.	265-307
	2		**Limits of functions (including one-sided limits)**	
		1	An intuitive understanding of the limiting process	79-87
		2	Calculating limits using algebra	87-97
		3	Estimating limits from graphs or tables of data	79-87
	3		**Asymptotic and unbounded behavior**	
		1	Understanding asymptotes in terms of graphical behavior	110-121
		2	Describing asymptotic behavior in terms of limits involving infinity	110-121
		3	Comparing relative magnitudes of functions and their rates of change (for example, contrasting exponential growth, polynomial growth, and logarithmic growth) - *Student Activity: "Order of Magnitude of a Function"*	
	4		**Continuity as a property of functions**	
		1	An intuitive understanding of continuity. (The function values can be made as close as desired by taking sufficiently close values of the domain.)	97-109
		2	Understanding continuity in terms of limits	97-109
		3	Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem)	97-109, 265-277
2			**Derivatives**	
	1		**Concept of the derivative**	
		1	Derivative presented graphically, numerically, and analytically	146-170
		2	Derivative interpreted as an instantaneous rate of change	146-158
		3	Derivative defined as the limit of the difference quotient	159-170
		4	Relationship between differentiability and continuity	159-170
	2		**Derivative at a point**	
		1	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.	74-79, 159-170, 265-277
		2	Tangent line to a curve at a point and local linear approximation	146-158, 242-255
		3	Instantaneous rate of changes as the limit of average rate of change	146-158
		4	Approximate rate of change from graphs and tables of values	159-170
	3		**Derivative as a function**	
		1	Corresponding characteristics of graphs of f and f'	159-170
		2	Relationship between the increasing and decreasing behavior f of and the sign of	277-286
		3	The Mean Value Theorem and its geometric consequences	226-235
		4	Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.	566-577
	4		**Second derivatives**	
		1	Corresponding characteristics of the graphs of f, f', f''	286-296
		2	Relationship between the concavity of f and the sign of f''	286-296
		3	Points of inflection as places where concavity changes	286-296

		Topic	Pages
5		**Applications of derivatives**	
	1	Analysis of curves, including the notions of monotonicity and concavity	277-307
	2	Optimization, both absolute (global) and relative (local) extrema	265-277, 308-320
	3	Modeling rates of change, including related rates problems	321-338
	4	Use of implicit differentiation to find the derivative of an inverse function	216-226
	5	Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration	146-158, 170-180
	6	Geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations	587-599
6		**Computation of derivatives**	
	1	Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric and inverse trigonometric functions	170-180, 196-226, 416-426
	2	Basic rules for the derivatives of sums, products, and quotients of functions	170-188
	3	Chain rule and implicit differentiation	189-195, 216-226
3		**Integrals**	
1		**Interpretations and properties of definite integrals**	
	1	Definite integrals as a limit of Riemann sums	369-383
	2	Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval: $\int_a^b f'(x)\,dx = f(b) - f(a)$	369-393, 432-441
	3	Basic properties of definite integrals (examples include additivity and linearity)	369-383
2		**Applications of integrals**	
	1	Appropriate integrals are used in a variety of applications to model physical, biological, or economics 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 method of setting up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include using the integral of a rate of change to give the accumulated change, 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.	344-354, 362-393, 432-464, 484-505
3		**Fundamental Theorem of Calculus**	
	1	Use of the Fundamental Theorem to evaluate definite integrals	383-393
	2	Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined.	383-393
4		**Techniques of antidifferentiation**	
	1	Antiderivatives following directly from derivatives of basic functions	344-354, 510-514, 521-530
	2	Antiderivatives by substitution of variables (including change of limits for definite integrals)	393-402, 510-514, 521-530
5		**Applications of antidifferentiation**	
	1	Find specific antiderivatives using initial conditions, including applications to motion along a line	344-354, 472-484
	2	Solving separable differential equations and using them in modeling (in particular, studying the equation $y'=ky$ and exponential growth)	566-587
6		**Numerical approximations to definite integrals**	
	1	Use of Riemann sums (using left, right, and midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values	362-383, 402-416

			Topic	Pages
			Part 2: AP Calculus BC (* indicates change and/or addition for BC course)	
1			**Functions, Graphs, and Limits**	
	1		**Analysis of graphs**	
		1	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.	265-307
	2		**Limits of functions (including one-sided limits)**	
		1	An intuitive understanding of the limiting process	79-87
		2	Calculating limits using algebra	87-97
		3	Estimating limits from graphs or tables of data	79-87
	3		**Asymptotic and unbounded behavior**	
		1	Understanding asymptotes in terms of graphical behavior	110-121
		2	Describing asymptotic behavior in terms of limits involving infinity	110-121
		3	Comparing relative magnitudes of functions and their rates of change (for example, contrasting exponential growth, polynomial growth, and logarithmic growth) - *Student Activity: “Order of Magnitude of a Function”*	
	4		**Continuity as a property of functions**	
		1	An intuitive understanding of continuity. (The function values can be made as close as desired by taking sufficiently close values of the domain.)	97-109
		2	Understanding continuity in terms of limits	97-109
		3	Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem)	97-109, 265-277
	5		***Parametric, polar, and vector functions**	
		1	The Analysis of planar curves includes those given in parametric form, polar form and vector form.	716-725, 742-754, 786-796, 854-864
2			**Derivatives**	
	1		**Concept of the derivative**	
		1	Derivative presented graphically, numerically, and analytically	146-170
		2	Derivative interpreted as an instantaneous rate of change	146-158
		3	Derivative defined as the limit of the difference quotient	159-170
		4	Relationship between differentiability and continuity	159-170
	2		**Derivative at a point**	
		1	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.	74-79, 159-170, 265-277
		2	Tangent line to a curve at a point and local linear approximation	146-158, 242-255
		3	Instantaneous rate of changes as the limit of average rate of change	146-158
		4	Approximate rate of change from graphs and tables of values	159-170
	3		**Derivative as a function**	
		1	Corresponding characteristics of graphs of f and f'	159-170
		2	Relationship between the increasing and decreasing behavior f of and the sign of	277-286
		3	The Mean Value Theorem and its geometric consequences	226-235
		4	Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.	566-577
	4		**Second derivatives**	
		1	Corresponding characteristics of the graphs of f, f', f''	286-296
		2	Relationship between the concavity of f and the sign of f''	286-296
		3	Points of inflection as places where concavity changes	286-296
	5		**Applications of derivatives**	
		1	Analysis of curves, including the notions of monotonicity and concavity	277-307
		2	*Analysis of planar curves given in parametric form, polar form, and vector form, including velocity and acceleration	726-734, 755-763, 864-877, 895-896
		3	Optimization, both absolute (global) and relative (local) extrema	265-277, 308-320
		4	Modeling rates of change, including related rates problems	321-338
		5	Use of implicit differentiation to find the derivative of an inverse function	216-226
		6	Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration	146-158, 170-180
		7	Geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations	587-599
		8	*Numerical solution of differential equations using Euler's method	587-599
		9	*L'Hopitals Rule, including its use in determining limits and convergence of improper integrals and series	255-265, 546-561, 636-648, 656-664

		Topic	Pages
	6	**Computation of derivatives**	
	1	Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric and inverse trigonometric functions	170-180, 196-226, 416-426
	2	Basic rules for the derivatives of sums, products, and quotients of functions	170-188
	3	Chain rule and implicit differentiation	189-195, 216-226
	4	*Derivatives of parametric, polar, and vector functions	726-734, 755-764, 864-875
3		**Integrals**	
	1	**Interpretations and properties of definite integrals**	
	1	Definite integrals as a limit of Riemann sums	369-383
	2	Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval: $\int_a^b f'(x)\,dx = f(b) - f(a)$	369-393, 432-441
	3	Basic properties of definite integrals (examples include additivity and linearity)	369-383
	2	***Applications of integrals**	
	1	*Appropriate integrals are used in a variety of applications to model physical, biological, or economics 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 method of setting up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include using the integral of a rate of change to give the accumulated change, finding the area of a region (including a region bounded by polar curves), 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, and the length of a curve (including a curve given in parametric form).	74-79, 344-354, 362-393, 432-464, 484-505, 464-472, 734-742, 755-764
	3	**Fundamental Theorem of Calculus**	
	1	Use of the Fundamental Theorem to evaluate definite integrals	383-393
	2	Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined.	383-393
	4	**Techniques of antidifferentiation**	
	1	Antiderivatives following directly from derivatives of basic functions	344-354, 510-514, 521-530
	2	*Antiderivatives by substitution of variables (including change of limits for definite integrals), parts, and simple partial fractions (nonrepeating linear factors only)	393-402, 510-538
	3	*Improper integrals (as limits of definite integrals)	546-561
	5	**Applications of antidifferentiation**	
	1	Find specific antiderivatives using initial conditions, including applications to motion along a line	344-354, 472-484
	2	Solving separable differential equations and using them in modeling (in particular, studying the equation $y'=ky$ and exponential growth)	566-587
	3	*Solving logistic differential equations and using them in modeling	327-338, 577-587
	6	**Numerical approximations to definite integrals**	
	1	Use of Riemann sums (using left, right, and midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values	362-383, 402-416
4		***Polynomial Approximations and Series**	
	1	***Concept of series**	
	1	*A series is defined as a sequence of partial sums, and convergence is defined in terms of the limit of the sequence of partial sums. Technology can be used to explore convergence or divergence	612-636
	2	***Series of constants**	
	1	*Motivating examples, including decimal expansion	626-636
	2	*Geometric series with applications	626-636
	3	*The harmonic series	626-636
	4	*Alternating series with error bound	648-655
	5	*Terms of series as areas of rectangles and their relationship to improper integrals, including the integral test and its use in testing the convergence of p-series	636-648
	6	*The ratio test for convergence and divergence	656-664
	7	*Comparing series to test for convergence or divergence	636-648

		Topic	Pages
3		***Taylor series**	
	1	*Taylor polynomial approximation with graphical demonstration of convergence (for example, viewing graphs of various Taylor polynomials of the sine function approximating the sine curve)	672-685
	2	*Maclaurin series and the general Taylor series centered at $x = a$	672-685
	3	*Maclaurin series for the functions $e^x, \sin x, \cos x,$ and $\frac{1}{1-x}$	672-685
	4	*Formal manipulation of Taylor series and shortcuts to computing Taylor series, including substitution, differentiation, and antidifferentiation, and the formation of new series from known series	664-694
	5	*Functions defined by power series	664-672
	6	*Radius and interval of convergence of power series	664-672
	7	*Lagrange error bound for Taylor polynomials	672-685