



## AP Calculus Curriculum Survey Spring 2004

Thank you for participating in the Advanced Placement Program® (AP®) curriculum survey for Calculus AB and BC. The following is a summary of the results from the survey, as well as a list of participating institutions. We hope you find this information helpful.

Please feel free to contact us with any questions you may have.

Sincerely,

Fred Kluempfen  
 Assessment Specialist in Mathematics  
 ETS, Princeton, NJ  
 e-mail: fkluempfen@ets.org

### A. General Course Information

#### Length in Weeks

<u>Calculus 1</u>	<u>Calculus 2</u>	
4%	4%	8-10 Weeks
1%	2%	11-12 Weeks
44%	43%	13-14 Weeks
51%	51%	15+ Weeks
<hr style="width: 50%; margin: 0 auto;"/> 168	<hr style="width: 50%; margin: 0 auto;"/> 168	Total Count of Responses

#### Number of regular class sessions per week (excluding recitations and labs)

<u>Calculus 1</u>	<u>Calculus 2</u>	
0%	0%	1 Class Session
7%	7%	2 Class Sessions
37%	39%	3 Class Sessions
38%	39%	4 Class Sessions
19%	15%	5 Class Sessions
<hr style="width: 50%; margin: 0 auto;"/> 168	<hr style="width: 50%; margin: 0 auto;"/> 168	Total Count of Responses

#### Number of Minutes per Class

<u>Calculus 1</u>	<u>Calculus 2</u>	
0%	0%	0-45 Minutes
69%	68%	46-50 Minutes
10%	11%	51-60 Minutes
14%	13%	61-75 Minutes
2%	2%	76-90 Minutes
5%	5%	91-120 Minutes
0%	0%	120+ Minutes
<hr style="width: 50%; margin: 0 auto;"/> 168	<hr style="width: 50%; margin: 0 auto;"/> 168	Total Count of Responses

*Number of Minutes in Mandatory Recitation*

<u>Calculus 1</u>	<u>Calculus 2</u>	
74%	75%	0-45 Minutes
9%	8%	46-50 Minutes
2%	2%	51-60 Minutes
4%	4%	61-75 Minutes
2%	1%	76-90 Minutes
5%	6%	91-120 Minutes
5%	4%	121-180 minutes
103	102	Total Count of Responses

*Number of Minutes in Computer Lab*

<u>Calculus 1</u>	<u>Calculus 2</u>	
88%	88%	0-45 Minutes
5%	4%	46-50 Minutes
1%	2%	51-60 Minutes
3%	3%	61-75 Minutes
0%	0%	76-90 Minutes
2%	2%	91-120 Minutes
1%	1%	121-180 minutes
102	99	Total Count of Responses

**B. Examinations**

Please rate the following according to importance in the courses (high, medium, or low) and indicate which you include in your exams.

<b>Topic</b>	<b>Importance</b>				<b>Placement on Exams</b>		
	Response Count	Low	Medium	High	Response Count	Yes	No
<i>Open-ended questions</i>	166	18.7%	29.5%	51.8%	154	67.5%	32.5%
<i>Use of technology</i>	166	30.7%	49.4%	19.9%	154	57.1%	42.9%
<i>Symbolic manipulation of derivatives and integrals (without use of technology)</i>	167	3.0%	25.7%	71.3%	158	95.6%	4.4%
<i>Formal proofs</i>	164	66.5%	28.7%	4.9%	151	39.1%	60.9%

**C. Course Content**

<b>Topic</b>	<b>Covered in Calculus 1</b>				<b>Covered in Calculus 2</b>			
	Response Count	Not Covered	Not Critical	Critical	Response Count	Not Covered	Not Critical	Critical
<i>Limits of Functions</i>	169	1.2%	6.5%	92.3%	169	64.5%	9.5%	26.0%
<i>Asymptotic/Unbounded Behavior</i>	169	4.1%	30.2%	65.7%	169	56.2%	13.6%	30.2%

<b>Topic</b>	<b>Covered in Calculus 1</b>				<b>Covered in Calculus 2</b>			
	Response Count	Not Covered	Not Critical	Critical	Response Count	Not Covered	Not Critical	Critical
<i>Continuity as a Property of Functions</i>	169	1.8%	12.4%	85.8%	169	69.8%	12.4%	17.8%
<i>Definition and Computation of Derivatives</i>	169	3.0%	1.8%	95.3%	169	68.6%	7.7%	23.7%
<i>Multiple Representations of Functions and Derivatives</i>	169	2.4%	23.7%	74.0%	169	55.6%	16.0%	28.4%
<i>Derivative as a Function</i>	169	1.8%	2.4%	95.9%	169	67.5%	8.3%	24.3%
<i>Interpretation of the Derivative as a Rate of Change</i>	169	0.6%	4.7%	94.7%	169	65.1%	14.2%	20.7%
<i>Implicit Differentiation</i>	169	6.5%	18.9%	74.6%	169	76.3%	12.4%	11.2%
<i>Second Derivatives</i>	169	0.6%	4.7%	94.7%	169	71.6%	12.4%	16.0%
<i>Mean Value Theorem</i>	169	4.1%	37.9%	58.0%	169	82.2%	10.1%	7.7%
<i>Analysis of Curves</i>	169	4.1%	8.3%	87.6%	169	74.6%	13.0%	12.4%
<i>Analysis of Planar Curves given in Parametric Form</i>	169	68.0%	22.5%	9.5%	169	34.9%	21.9%	43.2%
<i>Analysis of Planar Curves given in Polar Form</i>	169	89.3%	7.1%	3.6%	169	36.1%	22.5%	41.4%
<i>Planar Velocity and Acceleration Vectors</i>	169	76.9%	11.2%	11.8%	169	69.8%	15.4%	14.8%
<i>Optimization</i>	169	3.0%	3.0%	94.1%	169	69.8%	11.2%	18.9%
<i>Modeling Rates of Change</i>	169	7.7%	11.2%	81.1%	169	81.1%	8.9%	10.1%
<i>L'Hôpital's Rule</i>	169	50.9%	14.8%	34.3%	169	35.5%	9.5%	55.0%
<i>Definite Integral as Limit of Riemann Sums</i>	169	14.8%	7.7%	77.5%	169	53.8%	10.1%	36.1%
<i>Approximation of Definite Integrals by Riemann and Trapezoidal Sums</i>	169	29.0%	27.2%	43.8%	169	39.6%	23.7%	36.7%
<i>Error Estimates for Numerical Integration</i>	169	59.8%	37.3%	3.0%	169	45.0%	37.9%	17.2%
<i>Basic Properties of Definite Integrals</i>	169	15.4%	9.5%	75.1%	169	50.9%	8.3%	40.8%
<i>Fundamental Theorem of Calculus</i>	169	15.4%	1.8%	82.8%	169	50.3%	4.7%	45.0%
<i>Use of the FTC to Represent Particular Antiderivatives</i>	169	18.3%	16.0%	65.7%	169	46.2%	12.4%	41.4%

<b>Topic</b>	<b>Covered in Calculus 1</b>				<b>Covered in Calculus 2</b>			
	Response Count	Not Covered	Not Critical	Critical	Response Count	Not Covered	Not Critical	Critical
<i>Antiderivatives Following from Derivatives of Basic Functions</i>	169	13.0%	4.7%	82.2%	169	43.2%	7.7%	49.1%
<i>Antidifferentiation by Simple Substitution</i>	169	26.6%	5.3%	68.0%	169	29.0%	6.5%	64.5%
<i>Antidifferentiation by Parts</i>	169	88.8%	3.6%	7.7%	169	7.1%	3.0%	89.9%
<i>Antidifferentiation by Simple Partial Fractions</i>	169	94.1%	2.4%	3.6%	169	10.7%	23.1%	66.3%
<i>Antidifferentiation using Trigonometric Substitution</i>	169	93.5%	3.0%	3.6%	169	13.6%	24.9%	61.5%
<i>Improper Integrals</i>	169	91.1%	3.6%	5.3%	169	5.9%	10.1%	84.0%
<i>Finding Specific Antiderivatives using Initial Conditions</i>	169	45.0%	15.4%	39.6%	169	21.3%	19.5%	59.2%
<i>Finding Areas of Regions</i>	169	31.4%	8.9%	59.8%	169	22.5%	5.3%	72.2%
<i>Finding Areas of Regions Bounded by Polar Curves</i>	169	94.7%	3.6%	1.8%	169	36.1%	26.6%	37.3%
<i>Finding Volume of Solids with Known Cross Sections</i>	169	67.5%	11.2%	21.3%	169	21.9%	15.4%	62.7%
<i>Finding the Average Value of a Function</i>	169	49.1%	22.5%	28.4%	169	34.9%	32.5%	32.5%
<i>Finding the Length of a Curve</i>	169	82.8%	8.3%	8.9%	169	16.0%	27.8%	56.2%
<i>Finding the Length of a Curve given in Parametric Form</i>	169	95.9%	1.2%	3.0%	169	24.3%	37.3%	38.5%
<i>Applications of Integrals in Various Contexts to Model Physical, Biological, or Economic Situations</i>	169	61.5%	16.6%	21.9%	169	14.8%	32.0%	53.3%
<i>Applications of Integrals to Work and Force</i>	169	78.1%	11.2%	10.7%	169	21.3%	33.1%	45.6%
<i>Applications of Integrals to Moments, Mass, and Center of Mass</i>	169	87.6%	6.5%	5.9%	169	31.4%	37.9%	30.8%
<i>Solving Separable Differential Equations</i>	169	78.7%	11.8%	9.5%	169	27.2%	28.4%	44.4%
<i>Geometric Interpretation of Differential Equations via Slope Fields</i>	169	86.4%	9.5%	4.1%	169	56.8%	21.3%	21.9%
<i>Numerical Solutions of Differential Equations using Euler's Method</i>	169	93.5%	2.4%	4.1%	169	64.5%	22.5%	13.0%
<i>Study of Logistic Differential Equations</i>	169	94.7%	4.1%	1.2%	169	54.4%	29.0%	16.6%
<i>Qualitative Analysis of Differential Equations</i>	169	95.3%	2.4%	2.4%	169	63.9%	24.9%	11.2%

<b>Topic</b>	<b>Covered in Calculus 1</b>				<b>Covered in Calculus 2</b>			
	Response Count	Not Covered	Not Critical	Critical	Response Count	Not Covered	Not Critical	Critical
<i>Solution Techniques for Non-Separable Differential Equations</i>	169	98.8%	0.6%	0.6%	169	77.5%	15.4%	7.1%
<i>Numerical Techniques for Differential Equations Beyond Euler's Method</i>	170	99.4%	0.0%	0.6%	169	91.7%	7.1%	1.2%
<i>Series, Including Geometric, Harmonic, Alternating, and p-Series</i>	170	97.6%	0.6%	1.8%	169	14.2%	1.2%	84.6%
<i>Tests for Convergence and Divergence</i>	169	98.2%	0.0%	1.8%	169	15.4%	4.7%	79.9%
<i>Taylor Polynomial Approximations to Functions</i>	169	96.4%	0.6%	3.0%	169	14.8%	4.1%	81.1%
<i>Maclaurin and Taylor Series</i>	169	97.0%	1.2%	1.8%	169	16.6%	4.7%	78.7%
<i>Functions Defined by Power Series</i>	169	98.8%	0.6%	0.6%	169	16.0%	7.1%	76.9%
<i>Radius and Interval of Convergence of Power Series</i>	169	98.8%	0.6%	0.6%	169	16.0%	5.3%	78.7%
<i>Lagrange Error Bound for Taylor Polynomials</i>	169	99.4%	0.6%	0.0%	169	30.8%	39.6%	29.6%
<i>Fourier Series</i>	170	99.4%	0.6%	0.0%	169	81.7%	12.4%	5.9%
<i>Hyperbolic Functions</i>	169	89.3%	7.1%	3.6%	169	49.1%	39.6%	11.2%
<i>Partial Derivatives</i>	169	98.8%	0.6%	0.6%	169	84.0%	4.1%	11.8%
<i>Gradients, Directional Derivatives, and Tangent Planes</i>	171	98.8%	0.6%	0.6%	169	90.5%	3.0%	6.5%
<i>Lagrange Multipliers</i>	169	99.4%	0.0%	0.6%	169	91.7%	4.1%	4.1%
<i>Multiple Integrals-Rectangular</i>	170	99.4%	0.6%	0.0%	169	91.1%	1.8%	7.1%
<i>Multiple Integrals-Polar</i>	170	99.4%	0.0%	0.6%	169	92.9%	2.4%	4.7%
<i>Multiple Integrals-Spherical and Cylindrical</i>	170	99.4%	0.6%	0.0%	169	92.9%	2.4%	4.7%
<i>Change of Variables in Multiple Integration</i>	171	98.8%	1.2%	0.0%	169	94.1%	2.4%	3.6%
<i>Applications of Multiple Integrals</i>	171	98.8%	0.0%	1.2%	169	91.7%	3.0%	5.3%
<i>Systems of Difference Equations</i>	169	99.4%	0.0%	0.6%	169	98.2%	0.6%	1.2%
<i>Systems of Differential Equations</i>	169	98.2%	0.6%	1.2%	169	94.1%	4.1%	1.8%

What percent of the course is devoted to the following topics?

<b>Topic</b>	<i>Response Count</i>	<i>0 %</i>	<i>1 - 10 %</i>	<i>11 - 20 %</i>	<i>More than 20%</i>
<i>Differential Equations in Calculus 1</i>	163	44.8%	50.3%	3.7%	1.2%
<i>Differential Equations in Calculus 2</i>	165	18.8%	49.1%	25.5%	6.7%
<i>Series in Calculus 2</i>	165	12.1%	3.6%	27.3%	57.0%
<i>Multivariable Calculus in Calculus 2</i>	160	82.5%	6.3%	3.8%	7.5%



*AP Calculus Curriculum Survey  
Participating Institutions*

*(Names of Institutions appear in the format entered by the respondent.)*

*Abilene Christian Univ  
Agnes Scott College  
Albion College  
Alfred State College  
Alfred University  
Amherst College  
Arizona Western College  
Arkansas Tech University  
Augusta College  
Baldwin-Wallace College  
Baylor University  
Belmont University  
Binghamton University  
Bloomsburg University  
Bradley University  
Brigham Young University  
Bucknell University  
Butler University  
Carroll College  
Central College  
Centre College  
Chicago State U.  
City College, San Francisco  
Clemson University  
Colby College  
Colgate University  
Colorado School of Mines  
Colorado State University  
Columbia College (Missouri)  
Columbia University  
Columbus State University  
Cornell University  
Cottey College  
Cuyamaca College  
CWRU  
Davidson College  
Davidson County Community College  
Defiance College  
Delta College  
Dordt College  
Earlham College  
East Central Community College  
Eastern Mennonite University  
Eastern Michigan University  
Edinboro University of PA  
Elizabethtown College  
Fairmont State University  
Francis Marion University  
Front Range Community College  
Fullerton College  
Gainesville College  
George Washington University  
Georgia Institute of Technology  
Gettysburg College  
Grand View College  
Grove City College  
Harper College  
Harvey Mudd College  
Hastings College  
Haverford College  
Henderson State University  
Hollins University  
Honolulu Community College  
Iowa State University  
Jacksonville University  
Jefferson Community College  
John Carroll University  
Johns Hopkins University  
Kalamazoo College  
Lafayette College  
Lake Superior State University  
LeMoyne  
Lewis and Clark College  
Linfield College  
Louisiana State University  
Macalester College  
Malone College  
Marquette University  
McGill University  
Mercer University*

Messiah College  
Miami University  
Michigan Tech Univ  
Middle TN St Un  
Middlebury College  
Montgomery (Community) College  
Mount St. Mary's College  
Nassau Community College  
Nazareth College  
Nebraska Wesleyan University  
Northeastern University  
Northwest Missouri State University  
OK Panhandle St. Univ  
Oklahoma Baptist University  
Olivet Nazarene University  
Ouachita Baptist University  
Pacific Lutheran Univ.  
Pacific University  
Penn State University  
Pepperdine University  
Philadelphia Biblical University  
Piedmont Tech College  
Pittsburg State University  
Pomona College  
Roane State Comm College  
Rockford College  
Saginaw Valley State University  
Saint Mary's U. of MN  
Sam Houston State Univ  
Santa Clara University  
Shenandoah University  
Smith College  
South Dakota State University  
Southern Polytechnic State University  
Southwest Baptist University  
Southwest Missouri State Univ  
St. Johns River Community College  
St. Thomas Aquinas College  
Stephen F Austin State  
SUNY College at Oswego  
SUNY Potsdam  
SUNY Rockland Community College  
Tarrant County College  
Taylor University  
The College of New Jersey  
The College of Wooster  
The Ohio State University  
The University of Texas at Brownsville

Tompkins-Cortland Community College  
Trinity College  
Trinity University  
Tri-State University  
U. of Houston  
U. WI - Stevens Point  
UBC  
Univ of Ark @ Monticello  
Univ of Colo at Denver  
Univ of Pittsburgh at Bradford  
University of Alberta  
University of Connecticut  
University of Evansville  
University of La Verne  
University of Michigan-Flint  
University of New Haven  
University of North Carolina at Chapel Hill  
University of North Carolina at Charlotte  
University of Northern Iowa  
University of Redlands  
University of Richmond  
University of South Carolina  
University of Southern California  
University of Tennessee at Chattanooga  
University of Wisconsin - Platteville  
US Air Force Academy  
US Military Academy  
Vermont Technical College  
Webb Institute  
Wells College  
Wesleyan University  
West Virginia University at Parkersburg  
Westminster College (Pennsylvania)  
Wheeling Jesuit University  
Winthrop University