

**AP Calculus AB & BC Conference – Experienced Teachers
Grayslake, IL
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Agenda

- I. Introduction
- II. Concerns for Any AP Calculus Teacher
 - A. Background of students and how they are selected (e.g., AP Potential)
 - B. Time commitment for the student and teacher
 - C. Textbook selection
 - D. Course content, organization, pacing, and sequence
 - E. AP Audit – find sample syllabi at <http://fivay.org/syllabus/>
 - F. Testing & homework
 - G. Calculators
 - H. Student & teacher resources
 - I. AP Exam preparation
- III. Changes for the 2016-2017 school year in AP Calculus
<https://advancesinap.collegeboard.org/stem/calculus>
- IV. Curriculum Framework
<https://secure-media.collegeboard.org/digitalServices/pdf/ap/ap-calculus-curriculum-framework.pdf>
- V. 2015 AB & BC Exam & Scoring Guidelines
- VI. Incorporating Writing Into AP Calculus
- VII. Incorporating Technology Into AP Calculus
- VIII. Sharing of Materials and Teaching Techniques

AP® Equity and Access Policy

The College Board strongly encourages educators to make equitable access a guiding principle for their AP programs by giving all willing and academically prepared students the opportunity to participate in AP. We encourage the elimination of barriers that restrict access to AP for students from ethnic, racial, and socioeconomic groups that have been traditionally underserved. Schools should make every effort to ensure their AP classes reflect the diversity of their student population. The College Board also believes that all students should have access to academically challenging coursework before they enroll in AP classes, which can prepare them for AP success. It is only through a commitment to equitable preparation and access that true equity and excellence can be achieved.

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AP® Potential

AP Potential is a free, Web-based tool that allows schools to generate rosters of students who are likely to score a 3 or better on a given AP Exam. Based on research that shows strong correlations between PSAT/NMSQT scores and AP Exam results, AP Potential is designed to help you increase access to AP and to ensure that no student who has the chance of succeeding in AP is overlooked.

Every school's AP Coordinator is given multiple user logins and passwords for you as the teacher to use this wonderful tool. Please see the website below for more details.

<https://appotential.collegeboard.com/welcome.do>

AP® Central

In order to access some of the full AP practice exams, you do need to register with the College Board on the audit page <http://www.collegeboard.com/html/apcourseaudit/>. All of the main links below will work without registering but you may not be able to access certain pages within them.

AB Homepage: http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2178.html

BC Homepage: http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2118.html

Exam Calendar: <http://apcentral.collegeboard.com/apc/public/exam/calendar/index.html>

Exam Questions for AB and BC:

AB: http://apcentral.collegeboard.com/apc/members/exam/exam_information/1997.html

BC: http://apcentral.collegeboard.com/apc/members/exam/exam_information/8031.html

Sign up for the AP Calculus Community:

<https://apcommunity.collegeboard.org/web/apcalculus/home>

Changes in the AP Calculus Exam for the 2016-2017 school year:

<https://advancesinap.collegeboard.org/stem/calculus>

Textbooks

1. Anton, Howard. *Calculus – Early Transcendentals*, 10th edition. John Wiley and Sons, Inc., New York, 2012. ISBN: 978-0-470-64769-1
2. Best, George. *Calculus: Concepts and Calculators*. 2nd edition. Venture Publishing Co., Andover, MA, 2000. ISBN: 188601809X
3. Finney, Demana, Waits, Kennedy. *Calculus – Graphical, Numerical, Algebraic*, 4th edition. Pearson Education/Prentice Hall, 2011. ISBN: 0133178579
4. Foerster, Paul. *Calculus: Concepts and Applications*, 2nd edition. Kendall Hunt, 2004. ISBN: 1-55953-654-3
5. Hughes-Hallett, Deborah. *Calculus Single and Multiple Variable*, 6th edition. John Wiley and Sons, Inc., New York, 2012. ISBN: 978-0-470-88853-7
6. Larson, Ron. *Calculus*, 10th edition. Cengage, Kentucky, 2014. ISBN: 9781285057095
7. Ostebee, Arnold, Paul Zorn. *Calculus from Graphical, Numerical, and Symbolic Points of View*, 2nd edition. W.H. Freeman, 2008. ISBN: 1429229721
8. Rogawski, Jon. *Calculus, Early Transcendentals*. 3rd edition. W. H. Freeman, 2015. ISBN: 1464114889
9. Stewart, James. *Calculus: Concepts and Contexts*, 4th edition. Cengage, Kentucky, 2013. ISBN: 9781285056548

Honors Problem Resources

- Past American Mathematics Competition (AMC) 10 & 12 Tests, formerly AHSME
<http://www.maa.org/math-competitions>
- MathCounts – middle school level challenges that are an excellent starting place for your first honors problems <http://mathcounts.org/>
- Zimmerman, Lawrence, and Gilbert Kessler. *ARML-NYSML (American Regions Math League) Contests 1989-1994*. Westford, Massachusetts: MathPro, 1995. (ARML is a national mathematics competition for high school students.)
- Fraga, Robert, ed. *Calculus Problems for a New Century*. Washington, D.C.: Mathematical Association of America, 1999.
- Your Local Mathematics Competitions – for the Midwest, check out Great Plains Math League (GPML) at <http://mathleague.org>

Lab, Project, and Review Resources

- Gough, Sam, Jill Gough, Debbie Crawford, and Mary Ann Gore. Work Smarter Not Harder (NSpire and TI-84 versions). Andover, Massachusetts: Venture Publishing, 2013.
- Solow, Anita E., Editor. Learning By Discovery, A Lab Manual for Calculus. Washington, D.C.: Mathematical Association of America, 1997.
- Howell, Mark, et al. Be Prepared for the AP Calculus Exam. Skylight Publishing, Andover, MA, 2005.
- McMullin, Lin. Teaching AP Calculus. 3rd edition. D & S Marketing System, New York, 2014. (**especially useful for new AP Calculus teachers**)
- Foerster, Paul. Calculus Explorations. Key Curriculum, Emeryville, CA, 1998.
- Albert, Benita and Phyllis Hillis. Calculus Calculator Labs. Skylight Publishing, Andover, MA, 2005.
- Schwartz, Stu. Calculus Cache of Hidden Treasures. Mastermathmentor.com, 2015.
- Calculus Resource Compilation. <http://designateddriver.wikispaces.com/>, 2015.
- May, Joe and Glen Van Brummelen. Calculus—Seeing Is Believing: A Visual Lab Manual. Fort Worth, TX: Harcourt Brace & Company, 1996.
- Cohen, Marcus S., Edward D. Gaughan, Arthur Knoebel, Douglas S. Kurtz, and David J. Pengelley. Student Research Projects in Calculus. Washington, D.C.: Mathematical Association of America, 1991.
- Jackson, Michael B. and John R. Ramsay, Editors. Problems for Student Investigation. Washington, D.C.: Mathematical Association of America, 1993.
- Kamischke, Ellen. A Watched Cup Never Cools. Key Curriculum Press, Emeryville, CA, 1999.
- Best, George and Richard Lux. Preparing for the 2015 Calculus (AB or BC) Exam. Venture Publishing, Andover, Massachusetts.
- Lederman, David, et al. Multiple Choice & Free Response Questions for AP Calculus Examinations (AB or BC). 9th edition, D & S Marketing System, New York.
- Korsunsky, Rita. Multiple Choice Questions to Prepare for the AP Calculus AB (or BC) Exam. www.mathboat.com, 2012.

The above resources are listed in order of importance, with the most used book/site listed first.

Sample of Honors Problems

HONORS PROBLEM #1 - DUE ON FRIDAY, AUGUST 25, 2000

A PORSCHE 911 CARRERA TURBO IS CLOCKED AT THE FOLLOWING DISTANCES AND TIMES ON A RACETRACK.

TIME (SECONDS)	DISTANCE (FEET)
0	0
1	50
2	125
3	225
4	350

ALL SCATTERPLOTS MAY BE PRINTED OFF OF YOUR CALCULATOR USING THE GRAPH LINK AT SCHOOL, OR THEY MAY BE SKETCHED BY HAND. SEE MRS. LAND FOR ASSISTANCE.

- A) CREATE A SCATTERPLOT OF THIS DATA IN AN APPROPRIATE WINDOW. FIND THE MOST APPROPRIATE CURVE TO FIT THE DATA AND EXPLAIN WHY YOU CHOSE THIS CURVE.
- B) FIND DATA POINTS TO REPRESENT THE PORSCHE'S VELOCITIES OVER THE ABOVE TIME INTERVAL. CREATE A SCATTERPLOT OF THE PORSCHE'S VELOCITIES IN AN APPROPRIATE WINDOW. FIND THE MOST APPROPRIATE CURVE TO FIT THE DATA, AND EXPLAIN WHY YOU CHOSE THIS CURVE.
- C) FIND DATA POINTS TO REPRESENT THE PORSCHE'S ACCELERATIONS OVER THE ABOVE TIME INTERVAL. CREATE A SCATTERPLOT OF THE PORSCHE'S ACCELERATIONS IN AN APPROPRIATE WINDOW. FIND THE MOST APPROPRIATE CURVE TO FIT THE DATA, AND EXPLAIN WHY YOU CHOSE THIS CURVE.
- D) SUPPOSE YOU WERE GIVEN A VIPER'S ACCELERATION DATA FOR A FIVE-SECOND INTERVAL, AND ITS BEST FITTING CURVE WAS QUADRATIC. MAKE SOME CONCLUSIONS ABOUT ITS DISTANCE AND VELOCITY FUNCTIONS AND EXPLAIN YOUR REASONING. YOU MAY USE GRAPHS AND/OR EQUATIONS IN YOUR EXPLANATION.
- E) SUPPOSE THE DISTANCES FROM THE ORIGINAL TABLE WERE ALL INCREASED BY 5 FEET, RESULTING IN THE FOLLOWING TABLE.

TIME (SECONDS)	DISTANCE (FEET)
0	5
1	55
2	130
3	230
4	355

HOW WOULD THIS CHANGE AFFECT THE GRAPHS OF THE DISTANCE, VELOCITY, AND ACCELERATION FOR THE PORSCHE?

HONORS PROBLEM
DUE FEBRUARY 13, 1997

Using your graphing calculator, construct the best valentine shape centered on your calculator screen, using only basic functions and their translations (no regression fits, etc.). Then find the area of your valentine. If your valentine shape were used to hold one-inch circular candies, how many could it hold? You will need to print out a picture of your valentine in addition to giving the equations used to create it and the above mentioned calculations. Be creative with your decorations. See Mrs. Land regarding a printout of your valentine after you have completed the problem.

Honors Problems #12
due on Friday, December 6, 2002

Prove each of the six derivative rules for the inverse trigonometric functions.

Four of the rules are listed on p. 243 of your text, and the other two are listed below.

$$D_x(\operatorname{arc\,cot} x) = \frac{-1}{1+x^2} \qquad D_x(\operatorname{arc\,csc} x) = \frac{-1}{|x|\sqrt{x^2-1}}$$

Honors Problem #5
due Friday, October 4, 2002

You and a partner must arrange a time to go driving. One of you will be the driver, and the other will be the data collector. You will collect data on the car's speed at given time intervals on both a highway and a regular street. When collecting data for the highway, I suggest that you begin timing when you are going down the on-ramp to get on the highway and then end timing when you are getting off of the highway. You will collect data every 5 seconds for at least a four-minute interval of time; you may do a longer period of time if you wish. I suggest that the passenger simply say "time" every five seconds, and the driver responds with the speed from the speedometer.

After collecting your data, organize it in tables with appropriate units (hours and miles/hour) and draw scatterplots of the two sets of data. Draw as smooth a curve as possible through the points. Since these graphs are representations of rate of change (miles per hour), these will be your f' graphs. Also draw graphs of f and f'' for both highway and street driving, and explain all characteristics that help you sketch these. Be sure to label each of your graphs with the appropriate units, and explain what the graphs of f and f'' represent.

For your highway data, connect your scatterplot data with straight lines from point to point, and connect your last point to the x -axis with a vertical line. Calculate the area bounded by the x -axis, the y -axis, the line plot and the vertical line mentioned above. What does this area represent, and why?