Calculus in High School
The Numbers

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High school graduates, 2007: **3,232,000**

2006 high school graduates who entered college within a year: **1,850,000**

2004 Bachelor’s degrees: **1,400,000**

- engineering & eng. technology: 78,200
- biological sciences: 61,500
- computer & information science: 59,500
- physical sciences: 18,000
- math & stat: 13,300

**230,500**

Dept. of Ed, NCES data
BC exam,
8,818 in 2002
15,533 in 2007
76% increase

College Board data
Conclusion:

Students completing calculus before their senior year are the best of the best, and their numbers are significant. What can colleges and universities do to encourage them to continue their study of mathematics?
AP Calculus has been growing at ~17,000/year (about 7%)

Estimated # of students taking Calculus in high school (NAEP, 2005): ~500,000

Estimated # of students taking Calculus I in college: ~500,000 (includes Business Calc)
High School Calculus breakdown:
380,000 take AP Calculus (College Board estimate)
50,000 take IB or Dual Enrollment
100,000 take another course with “Calculus” in the title
High School Calculus breakdown (2007 numbers):
380,000 take AP Calculus (College Board estimate)
276,004 took AP exam; AB: 211,693, BC: 64,311

**AB exam:**
- 5: 44,500
- 4: 39,600
- 3: 40,400
- 1–2: 92,500

**BC exam:**
- 5: 28,000
- 4: 11,500
- 3: 12,100
- 1–2: 12,700
About 340,000 students arrived at college this fall having taken calculus in high school but without bringing college credit for it.

From the high school class of 1992, over 30% of those who took calculus in high school enrolled in pre-calculus when they got to college. (Cliff Adleman, National Educational Longitudinal Study of 1988–2000; 31.5%, SE = 2.21).
Conclusion:

Colleges and universities need to pay serious attention to these students. They constitute a very large proportion of those who seek mathematically-intensive majors.

Although we need more data on what happens to these students, simply treating them as though they have not seen calculus before does not work.
College enrollment in Calculus I has been constant at about half a million students per year over the past quarter century.

During this time, the number of students arriving with credit for Calculus I has gone from a negligible number to about $140,000 + 20,000 = 160,000$.

The top third of the Calculus I students have disappeared and been replaced by an equal number of students who would not have taken Calculus in 1982.
Conclusion:

If students in college Calculus I seem less well prepared today than they did 20 years ago, it is because we are looking at a different segment of the student population.

This is not a reason to lower expectations, but it is reason to reconsider what it is we really want these students to learn and how we can adjust our pedagogy to help them accomplish it.
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