### Percentage of students in Calculus by gender/race/ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Research Universities</th>
<th>Masters Univ.</th>
<th>Undergraduate</th>
<th>2-year Colleges</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>45%</td>
<td>47%</td>
<td>47%</td>
<td>34%</td>
<td>43%</td>
</tr>
<tr>
<td>White</td>
<td>77%</td>
<td>77%</td>
<td>81%</td>
<td>67%</td>
<td>76%</td>
</tr>
<tr>
<td>Black</td>
<td>5%</td>
<td>8%</td>
<td>7%</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Asian-American</td>
<td>15%</td>
<td>9%</td>
<td>10%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9%</td>
<td>7%</td>
<td>10%</td>
<td>16%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Respondents could select more than one racial category. Self-identification as Hispanic was a separate question.
### Course taking in High School

**By students taking Calculus I at Research Universities**

<table>
<thead>
<tr>
<th>Course</th>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra II*</td>
<td>≤ 10(^{th}) grade</td>
<td>77%</td>
</tr>
<tr>
<td>Precalculus*</td>
<td>≤ 11(^{th}) grade</td>
<td>67%</td>
</tr>
<tr>
<td>Calculus</td>
<td>≤ 12(^{th}) grade</td>
<td>67%</td>
</tr>
<tr>
<td>Statistics</td>
<td>≤ 12(^{th}) grade</td>
<td>9%</td>
</tr>
</tbody>
</table>

* Does not count students who took an integrated curriculum
<table>
<thead>
<tr>
<th></th>
<th>PhD*</th>
<th>MA</th>
<th>BA</th>
<th>TYC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average HS math GPA</td>
<td>3.77</td>
<td>3.58</td>
<td>3.64</td>
<td>3.37</td>
</tr>
<tr>
<td>SAT Math</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (SD)</td>
<td>663 (70)</td>
<td>616 (81)</td>
<td>631 (72)</td>
<td>589 (95)</td>
</tr>
<tr>
<td>3rd Quartile Median</td>
<td>710</td>
<td>680</td>
<td>680</td>
<td>663</td>
</tr>
<tr>
<td>1st Quartile Median</td>
<td>620</td>
<td>560</td>
<td>590</td>
<td>520</td>
</tr>
</tbody>
</table>

* Classification by highest degree offered by department:
  PhD = research university
  MA = master’s university/comprehensive university
  BA = undergraduate college
  TYC = two-year college
Career goals of students in Mainstream Calculus I

- Engineer: 27%
- Biological science: 30%
- Comp sci: 7%
- Math: 2%
- Phys sci: 7%
- Teacher: 7%
- Soc sci: 1%
- Business: 7%
- Other: 4%
- Undecided: 8%
- Undecided: 8%
Gender differences of career goals of students in Mainstream Calculus I

Career Goals, all men
- Math: 38%
- Business: 19%
- Bio: 10%
- Comp: 10%
- Geo: 2%
- Eng: 5%
- Other: 3%
- Social: 1%
- Teacher: 4%
- Undecided: 7%

Career Goals, all women
- Bio: 43%
- Eng: 14%
- Comp: 2%
- Geo: 3%
- Teacher: 10%
- Other: 9%
- Business: 7%
- Social: 2%
- Undecided: 9%
Final Grades as Reported by Instructors

- **two year college**
  - A: 21.1%
  - B: 22.0%
  - C: 19.5%
  - D/FW: 37.5%

- **masters university**
  - A: 21.1%
  - B: 21.8%
  - C: 20.1%
  - D/FW: 37.1%

- **undergrad college**
  - A: 24.4%
  - B: 29.6%
  - C: 23.7%
  - D/FW: 22.3%

- **research university**
  - A: 22.7%
  - B: 29.7%
  - C: 22.9%
  - D/FW: 24.7%
<table>
<thead>
<tr>
<th></th>
<th>PhD</th>
<th>MA</th>
<th>BA</th>
<th>2 year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start of term:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Am ready for Calculus”</td>
<td>81%</td>
<td>77%</td>
<td>79%</td>
<td>81%</td>
</tr>
<tr>
<td><strong>End of term</strong>*:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Was ready for Calculus”</td>
<td>56%</td>
<td>51%</td>
<td>54%</td>
<td>57%</td>
</tr>
<tr>
<td>Can compute derivatives and integrals</td>
<td>66%</td>
<td>61%</td>
<td>60%</td>
<td>66%</td>
</tr>
<tr>
<td>Can solve word problems</td>
<td>41%</td>
<td>40%</td>
<td>40%</td>
<td>45%</td>
</tr>
<tr>
<td>This course increased interest in mathematics</td>
<td>29%</td>
<td>38%</td>
<td>29%</td>
<td>48%</td>
</tr>
</tbody>
</table>

* End of term responses only from “successful” students, 80% of whom were earning A or B.
Research University Students in Calculus I, Fall 2010

- No calc in HS: 30%
- AP exam ≥ 3: 26%
- AP exam < 3: 15%
- Calc in HS, no AP exam: 29%
Distribution of students with AP Scores $\geq 3$

- AB 3: 40%
- AB 4-5: 39%
- BC $\geq 3$: 19%
- AB $\geq 3$, BC $< 3$: 2%
The diagram shows the distribution of grades among different groups of students. For each category:

- **AP exam ≥ 3**: 34% A, 30% B, 18% C, 18% DFW
- **HS calc/no AP exam**: 25% A, 34% B, 18% C, 23% DFW
- **AP exam < 3**: 13% A, 26% B, 30% C, 31% DFW
- **no HS calc**: 14% A, 26% B, 26% C, 34% DFW
Switchers: students who started certain that they would go on to take Calculus II, but by the end of the term were no longer sure or had definitely decided not to continue.

Of those who started intending to take Calculus II:

- 11% of men were switchers
- 20% of women
Switchers by grade in Calculus I.

Women:
A: 10%  
B: 13%  
C: 24%

Men:
A: 6%   
B: 6%   
C: 12%
Switchers by intended major

Women in Bio Science:
  A or B: 19%       C: 29%

Men in Bio Science
  A or B: 13%       C: 26%

Women in Engineering:
  A or B: 4%        C: 19%

Men in Engineering
  A or B: 2%        C: 7%
<table>
<thead>
<tr>
<th>Reason for switching</th>
<th>Gender</th>
<th>Students earning A or B</th>
<th>Students earning C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too many other courses I need to take</td>
<td>Women</td>
<td>43%</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>42%</td>
<td>16%</td>
</tr>
<tr>
<td>Have changed major</td>
<td>Women</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>33%</td>
<td>39%</td>
</tr>
<tr>
<td>Takes too much time and effort</td>
<td>Women</td>
<td>33%</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>29%</td>
<td>26%</td>
</tr>
<tr>
<td>Bad experience in Calculus I</td>
<td>Women</td>
<td>18%</td>
<td>53%</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>19%</td>
<td>35%</td>
</tr>
<tr>
<td>Don’t understand calculus well enough</td>
<td>Women</td>
<td>18%</td>
<td>38%</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>4%</td>
<td>26%</td>
</tr>
<tr>
<td>Grade was not good enough</td>
<td>Women</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>0%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Students could select more than one response.
Students could select more than one response.
Observations:

1. Calculus I students were very successful in high school. They arrive with high confidence and a desire to understand calculus.

2. They do not know how to study. Passive instruction and assessments that focus on procedural mastery fail to promote engagement with the mathematics.

3. Students leave this course with greatly decreased confidence and frustration at lack of understanding. Particularly true of women.

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