Advanced Placement Calculus is not College Calculus

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A while ago I took a close look at the Advanced Placement (AP) Calculus AB Curriculum Framework for 2016–2017, the Syllabus Development Guide, and the AB Practice Exam from the 2014 Administration.

I'm quite fond of AP Calculus, having signed my high school up for the test and administered it to myself back in 1964. No doubt it helped me get out of Kansas to M.I.T.

AP Calculus AB in high school has some serious advantages over Calculus in college. It is a college semester's worth of material taught over an entire year, usually every school day, making about 150–180 hours of instruction, often in small classes compared to college, where the instruction time might well be closer to 50 hours in a large college lecture course. More students take Calculus in high school than in College.

The AP AB Calculus curriculum, according to the Framework, "is equivalent to that of a first-semester college Calculus course... and ... is designed to be taught over a full academic year." The College Board Administers an associated externally graded exam. High scores on the exam count for a semester of Calculus credit at many colleges and universities. This equivalence is an illusion. Calculus at my university, Johns Hopkins University, could not pass the audit to qualify for AP Calculus. This is equally true for many other universities and colleges.

I think highly of most items on the test, have some minor issues with the syllabus, but the very large flaw is the association of AP Calculus with the graphing calculator.

The graphing calculator is thoroughly integrated into all aspects of the AP AB course. The Framework is explicit: "The use of a graphing calculator is considered an integral part of the AP Calculus courses, and it is required on some portions of the exams." This statement that the graphing calculator must be an "integral" part of the course is too extreme for the simple reason that the graphing calculator is not integral to Calculus. Calculus can be taught and learned without any technology. The extensive use of the graphing calculator is also not reflective of college Calculus classes. At the college level, many professors do not emphasize (or even allow) the use of graphing calculators since there is no concept in Calculus that requires the technology either to teach or to assess.

Furthermore, the graphing calculator is not ideal technology for teachers who may want to use technology for illustrative purposes. The graphic display is very small and the resolution poor. Input methods can be time-consuming to learn and to teach, and many teachers may prefer to focus on the mathematics involved rather than spend time teaching how to work with graphing calculators. Students who will need computing technology in the future, will need more sophisticated devices than graphing calculators. The graphing calculator is an obsolete piece of electronic equipment that owes its continued existence to the unnecessary AP Calculus exam requirements.

Although the problems that are calculator-dependent tend to be real Calculus problems, the need for the graphing calculator to test the concepts and content knowledge is completely artificial. These questions do not represent "real world" situations by any stretch of the imagination. The graphing calculator is used on the exam to solve completely contrived problems designed so that the graphing calculator is required. Consequently, either the student's ability to use the graphing calculator is being tested as content, or the test is testing whether or not teachers have taught students how to use calculators. The graphing calculator is not Calculus content and pedagogy should not be tested. There is no justification for the graphing calculator to be used on the AP Calculus AB Exam.

The Syllabus Development Guide to AP Calculus AB gives further evidence of the misplaced emphasis on the graphing calculator. There are 12 scored components in the curricular requirements. Three of them are about the graphing calculator. To be an approved AP Calculus AB course, students MUST be taught "to use graphing calculators" to "help solve problems," to "experiment," and to "interpret results and support conclusions." None of these are necessary to prepare a student for a thorough Calculus exam.

The bottom line is that AP Calculus AB is supposed to be "equivalent" to a first semester college Calculus course. ***The wrong-headed view that graphing calculators and Calculus are inseparable means that many, if not most, college Calculus I courses would not meet the standards of the AP audit to be allowed to be called AP Calculus.*** It is inappropriate for high school Calculus to attempt to redefine the collegiate version of Calculus. This contradicts the College Board's intention that AP Calculus is equivalent to college Calculus.