Anything but Calculus! Alternatives to teaching Calculus in year 1
Les alternatives à l'enseignement du calcul en première année
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MARC DE BENEDETTI, University of Toronto
Should First-Year Calculus be Taught by Physicists?

How much calculus do non-math students actually need to be able to apply key concepts in real-life applications? Although a substantial amount of calculus is required to formally derive many important equations in science-based disciplines (e.g. equations of motion or population dynamics), is there a way to obtain many of these results by an exercise in critical thinking? Alternative topics that should be considered for such a first-year service calculus/math course will be discussed from the viewpoint of a physicist in the context of some selected examples to demonstrate how critical analysis can be used to obtain the answer without the use of advanced mathematics.

DEBORAH HUGHES HALLETT,
When Should Students Learn About Data? Now!

The world outside universities is using more and more data. Many of our students want to know about AI, big data, and machine learning——and some will go on to be successful in these fields. Let's think about how we can include working with data in as many courses as possible—inside and outside mathematics. Does data provide interesting examples? We will talk about the benefits—and challenges—of using data, with examples from the pandemic, sustainability, and climate change.

WES MACIEJEWSKI, San José State University
Life After Calculus

Though calculus has roots stretching back throughout human history, the teaching of calculus is a relatively recent phenomenon. If we managed so long without it, is it necessarily now here to stay in perpetuity? I argue that it isn't - that now is the time we ought to overcome calculus. This won't be easy, however, given the centrality of calculus in non-mathematics degree programs. Join me in imagining life after calculus.

CLAUS MICHELSEN, University of Southern Denmark
From a discipline-oriented year 1 to an interdisciplinary mathematical modeling course

For many years the science study programmes at the University of Southern Denmark had a common first year, called the Science Year, consisting of a number of courses in calculus, physics, chemistry and biology. In connection with an extensive reform project, the Science Year was changed to consist of a course centered around project work and two large courses. One of these was the course in interdisciplinary mathematical modeling. In the presentation, I present the didactical ideas of the course, as well as how the implementation of the course was supported with a didactic model for instruction and competence development of teachers including workshops and seminars.

CHRIS RASMUSSEN, San Diego State University
Dynamical Systems Instead of Calculus

In this presentation I outline how we might forgo calculus and start with dynamical systems. This approach would build on students intuitive and everyday experience with rate of change and engage them in realistic modeling problems, from population growth to climate change. Leveraging the instructional design theory of Realistic Mathematics Education, the course would embrace qualitative, graphical, and numerical approaches and focus on underlying concepts.

CHRIS SANGWIN, University of Edinburgh
Product vs process: problem solving as a year one activity.

There are two important strands to mathematical activity. The use of routine techniques (such as calculus), and problem solving. Many university mathematics courses in early years concentrate on the systematic use of routine techniques. In this talk I describe my experience of running a problem solving class for six years. The goal of this course was not to teach specific content, such as calculus, but to give students a direct experiences of the process of mathematical discovery. Based on the Socratic method, the fundamental point of the course was for students to solve problems themselves; to present their solutions to their peers; and to criticize the solutions of others. The course had three 50 min sessions per week, and for the content I chose problems in elementary geometry. The subject matter is less important than giving students interesting problems, expecting them to take responsibility and providing students with an opportunity to re-submit and improve their work. The experience of this course was mostly positive, robust to a variety of different problem sets and with a range of colleagues. The obvious difficulty is that the staff time required scales linearly with student numbers in a way which does not occur with large lectures. Hence, these courses are expensive in staff time. My conclusion is not that we can't afford to teach students in this way, but that we can't afford not to teach at least one early course in this way.

PETER TAYLOR, Queen's
Reinventing Calculus

The calculus reform movement goes back 40 years. While it introduced new kinds of problems, it forgot to change the "laundry list" structure of the curriculum. The result of this is too often a fragmented unimaginative curriculum that fails to prepare most of our students for the world they are entering. I will explain what I mean by "the structure of the curriculum" and will illustrate this with a couple of examples.

CONRAD WOLFRAM, Wolfram Research
Will mainstream maths education survive the AI age?

Coming Soon