Core Calculus Consortium

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Our philosophy: "The Rule of Three." The most difficult and the most necessary aspect of revitalizing calculus is getting our students to think. The old calculus has become a litany of procedures and template problems which too often results only in giving students some rather mindless algebra practice. In addition, students with weak backgrounds are usually driven away by frustration over the manipulations required, even if they are able to understand the basic ideas of calculus.

Our project is based on our belief that the graphical, numerical, and analytical aspects of calculus should all be emphasized throughout. We call this approach "The Rule of Three" and are working together to design a core curriculum based on this principle. Using the Rule of Three, students will repeatedly be confronted with the graphical and numerical meaning of what they are doing. Besides encouraging understanding, this approach gives students with weak manipulative skills a chance to grasp the concepts behind calculus while strengthening their backgrounds.

The Core Calculus Course: The core calculus curriculum is a two-quarter or two-semester course built around the Rule of Three. The graphical and numerical aspects of each topic are introduced throughout, along with the analytic. For example, consider the traditional introduction of the exponential function as the inverse of lnx, which is itself defined as an integral. This approach is lost on students who don't like logs and are not yet comfortable with integrals. Worse still, it obscures the most important fact about the exponential function—that its derivative is equal to itself. However, using a graphing program or a spreadsheet, it is easy to show students that 'e' is the one value of 'a' making the function of a^x and its derivative equal.

The idea of integration and of solving differential equations comes into our course early. We find that slope fields provide a way of introducing the integral which makes it clear graphically that integration reverses the process of differentiation. In addition, using a slope field makes the Fundamental Theorem of Calculus quite transparent.

Of course, if our good intentions are to have much effect, our tests as well as our presentation must reflect the Rule of Three. In addition, it is important to include some non-routine problems regularly. Even if such problems are not hard or long, we must start to re-establish the idea that such problems are not only part of mathematics, but, indeed, the point of mathematics.

Timetable: During 1990–91, preliminary versions of the Core Calculus Curriculum materials were taught at the consortium institutions. During the 1991–92 academic year, the materials were class-tested at all the consortium institutions and about twenty others; in 1992–93, class testing is taking place at over one-hundred institutions.

A preliminary version of the text is available from John Wiley (212-850-6000).

We welcome input and suggestions from the entire mathematics community, and invite its active participation in testing our approach.

Further Information: Herman Sudholz, Project Coordinator (617-496-5421); address above.

The New Sensible Calculus Program

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The Sensible Calculus Project (SCP) works to develop curriculum, pedagogy and technology, reforming calculus based on the themes of differential equations and estimation project motivated by modeling situations. This project has been a continuing effort since 1978. Recent work on the project has focused on materials that apply calculus consistently to an understanding of probability beginning early with a treatment of density functions as the derivatives of distribution functions. Other additions have been student journals and oral presentations reporting on outside reading from journals (and other nontraditional sources). Text materials are now more fully developed and a sampling is available for examination upon request with a payment of $10 to help cover costs.