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A historical perspective on teaching and learning calculus.

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Summary: Calculus is one of those topics in mathematics where the algorithmic manipulation of symbols is easier than understanding the underlying concepts. Around 1680 Leibniz invented a symbol system for calculus that codifies and simplifies the essential elements of reasoning. The calculus of Leibniz brings within the reach of an ordinary student problems that once required the ingenuity of an Archimedes or a Newton. One can mechanically "ride" the syntax of the notation without needing to think through the semantics. Calculus education typically has a strong routine aspect, focusing on methods for differentiation and integration without justifying these methods, since current teaching practice barely has time to discuss the underlying concepts. A question for the design of a teaching trajectory that focuses on ways to support the understanding of the underlying concepts is: How can students invent this? It is useful to look at the history of a topic to gain insight into this issue, to investigate concept development, and to analyze how and why people tried to organize certain phenomena without having any notion yet about the basic principles of calculus. In this paper, the authors will first review some highlights in the history of calculus. This review will lead into recommendations for an instructional sequence on calculus. The authors conclude with a plea for historical reflections in mathematics education as a method for changing routine-oriented practices. (Contains 5 figures.) (ERIC)

Classification: D35 I45 I55 D45

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