

**Concepts Fundamental to an Applicable Understanding of Calculus**  
Contributed Research Report

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Abstract

Calculus is an important tool for building mathematical models of the world around us and is thus used in a variety of disciplines, such as physics and engineering. These disciplines rely on calculus courses to provide the mathematical foundation needed for success in their discipline courses. Unfortunately, many students leave calculus with an exceptionally primitive understanding and are ill-prepared for discipline courses. This study seeks to identify the fundamental calculus concepts necessary for successful academic pursuits outside the undergraduate mathematics classroom, describe appropriate understanding of these concepts, and collect tasks that elicit, document, and measure this understanding. Data were collected through a series of interviews with select undergraduate mathematics and other discipline faculty members. The data were used to build descriptions of and frameworks for understanding the calculus concepts and generate the pool of tasks. Implications of these findings for calculus curriculum are presented.

*Keywords:* Calculus, understanding, design research