

The Calculus of a Vase

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Of the most universal applications in integral calculus are those involved with finding volumes of solids of revolution. These profound problems are typically taught with traditional approaches of the disk and shell methods, after which most calculus curriculums will additionally cover arc length and surfaces of revolution. Even in these visibly applied areas of calculus, it can often remain a challenge to develop meaningful hands-on assignments; however, according to *Beyond Crossroads* (2006), students in mathematics-intensive courses and programs should be able to "use numerical, graphical, symbolic, and verbal representations to solve problems and communicate with others; use technology as a tool for exploring mathematical concepts; and use a variety of mathematical models, including curve fitting" (AMATYC, 2006, p. 48). Thus, activities that can address these outcomes need to be included in the calculus curriculum.

The calculus of a vase project is an activity that any calculus teacher could immediately implement with only a handful of vases and a basic understanding of curve fitting. I cannot claim this project as my own singular development, as I was first exposed to the concept of using calculus to estimate the volumes of vases when I observed my colleague, Professor Mary Ann Tuerk, engaging her calculus students in the task. Professor Tuerk and I presented this project at the 2010 AMATYC Conference in Boston. The purpose of this project is to use calculus techniques to estimate the volume, surface area, and lateral height (arc length) of a vase.