

1106-49-30

Richard A. Tapia* (rat@rice.edu), Department of CAAM-MS 134, Rice University, 6100 Main St., Houston, TX 77005. *The Remarkable Journey of the Isoperimetric Problem: From Euler to Steiner to Weierstrass.*

In this presentation we give an overview of the remarkable life of the impactful isoperimetric problem. We identify three distinct classes of solution approaches that have been used throughout history; the Cartesian coordinate representation approach of Euler, the synthetic geometry approach of Steiner, and the parametric representation approach of Weierstrass. We say that one of our three classes of approaches has been completed when an appropriately short sufficiency proof has been constructed that belongs to this class. In 1744 in a legendary work Euler presented his contribution. Euler incorrectly believed that he had established sufficiency; when in reality he had not even established the necessity that he has been credited with by mathematical historians. This failure led Steiner in 1838 to propose his approach which gave only necessity and not sufficiency as he believed. The Steiner path was completed by Lawlor in 1998. Euler's and Steiner's failures led Weierstrass in 1879 to propose his approach, which did indeed lead to sufficiency but was excessively long. The Weierstrass approach was completed in 1934 by Littlewood, Hardy, and Polya. The major contribution in this presentation is the completion of Euler's approach. Our proof is surprisingly elementary. (Received September 03, 2014)