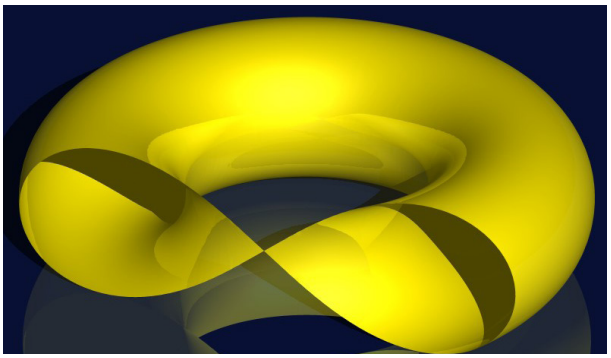
DEPARTMENT OF MATHEMATICS
Fall 2024 MATH Colloquium Series

From Here to Infinity: Lemniscates and Elliptic Integrals



Speaker: Dr. Walden Freedman, Dept of Math, Cal Poly Humboldt

Abstract: Lemniscates are figure-eight curves that have been of interest to mathematicians for centuries. Students' first encounter with these curves is often in a trigonometry or Calculus II course. The Bernoullis studied these curves in the late 17th century, (dubbing them with the term "lemniscus" from the Latin word for ribbon) with later contributions by Gauss and Euler, as well as G. Fagnango in 1750. We'll describe various classes of lemniscates such as Lemniscates of Booth, Hippopedes, Cassini Curves, and the lemniscate of Bernoulli. When we try to compute the arc length of the lemniscate or ellipse using integration we uncover the connection of these curves with elliptic integrals, (a class of integrals that can't be expressed only in terms of elementary functions). We'll discuss elliptic integrals of the first and second kinds, and the fascinating relation with the arithmetic-geometric mean of Gauss. We'll end with an application to the motion of a simple pendulum where we'll see the need for the inverses of elliptic integrals, which are called elliptic functions.

Nov. 7, 2024 **4:00 PM**
THURSDAY **BSS#166**

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WE CORDIALLY INVITE YOU TO THE PRE-COLLOQUIUM TEA IN BSS#312 AT 3:30 PM