MATH 102

MUCH ADO ABOUT EVERYTHING:
THE MATHEMATICS OF LEONHARD EULER

Spring, 2019

<u>Objectives</u>: This course addresses the colossal achievement of Leonhard Euler (1707 – 1783), one of the towering figures from the history of mathematics. For the first few weeks, we set the stage by considering results of such predecessors as Cardano, Newton, Leibniz, and the Bernoullis. Then we turn to Euler and examine selections, in their original form, from his collected works. Gauss later wrote that Euler's writings "… will remain the best school for the different fields of mathematics, and nothing else can replace them." And Laplace is reported to have urged his students to "Read Euler! Read Euler! He is the master of us all." This course, with its fusion of biography, history, and mathematics, is meant to demonstrate why these accolades are so richly deserved.

<u>Topics</u>: *Prologue*. Cardano and the solution of the cubic from the 16th century. Highlights from the early 17th century, including a taste of Fermat's number theory. The creation of the calculus by Newton and Leibniz. The work of the Bernoulli brothers, and l'Hospital's first calculus textbook.

   Euler: His biography. Selections from his contributions to the theory of numbers, functions, infinite series, calculus, Euclidean geometry, algebra, complex variables, and combinatorics. Among the specific results we study will be the Euclid-Euler theorem for even perfect numbers, the Basel problem, the Euler identity, the Euler product-sum formula, the Euler quadrilateral theorem, the Bridges of Königsberg, and the first partition theorem.

<u>Prerequisites</u>: Students should have completed the calculus sequence. Equally important, they should enjoy mathematics as an aesthetic, not just a practical, enterprise.

<u>Instructor</u>: William Dunham
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<u>Office Hours</u>: Tuesday, 9:00 – 10:00 am and 3:00 – 4:00 pm
          Thursday, 9:00 – 10:00 am

<u>Text</u>: W. Dunham, *Euler: The Master of Us All*, MAA (1999).

<u>Grading</u>: The course grade will be calculated from a total of 750 points as follows:

> *Weekly assignments*, containing problems related to the great theorems we discuss in class, will be distributed on Thursday and collected the following Thursday. At term's end, the results will be adjusted to a total of 200 points. Note: collaboration among students for these assignments is fine.

> *Projects*, four in number and dealing with somewhat more intricate topics, will be given on occasion throughout the semester. These will, collectively, account for 100 points. Because the projects are like mini take-home exams, collaboration is <u>not</u> permitted on these.

> A *midterm exam*, worth 150 points, will be given in class on Thursday, March 14.

> A *final exam*, worth 300 points, will be given during exam week.

Note: Weekly assignments and projects must be submitted on time. If you cannot be in class when one of these is due, please send it with a colleague or put it in my mailbox on the third floor of the Science Center. NO LATE ASSIGNMENTS WILL BE ACCEPTED.

<u>Attendance</u>: In an unusual course like this, regular attendance is strongly advised. However, attendance does not figure directly in the course grade.