



Department of Mathematical Sciences
The University of Texas at El Paso

EQUATION APPRECIATION CLASS
AT THE MATH MUSEUM

“Math Is Everywhere”

Helmut Knaust
Department of Mathematical Sciences





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UTEP's Math Department

- 24 Professors
- The department is offering about 160 courses per semester





Department of Mathematical Sciences *The University of Texas at El Paso*

- 248 Undergraduate Majors
BS in Mathematics,
with various concentrations
- 43 Graduate Students
MS in Mathematics
MS in Statistics
MAT in Mathematics
- Interdisciplinary Programs
MS in Bioinformatics
Ph.D. in Computational Science





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- Mathematics as a Career

Broad range of positions in

- Business,
- Industry,
- Government,
- and Education

Employers include

- Federal, state and local government,
- Computer and communications industry,
- Oil and energy companies,
- Banks and insurance companies,
- Pharmaceutical and biotechnology companies



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- Mathematics as a Career
 - Federal Agencies hiring Mathematicians include:
 - National Security Agency
 - Dept. of Health and Human Services
 - Dept. of Energy
 - Dept. of Defense
 - Dept. of Labor
 - A Mathematics major is also an excellent preparation for graduate studies in:
 - Medicine
 - Economics
 - Law School



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- High Job Satisfaction:

Ranked #2: Actuary (Insurance Mathematician)

Ranked #10: Mathematician

Ranked #18: Statistician

Based on five criteria:

1. Income
2. Work Environment
3. Employment outlook
4. Physical demands
5. Stress

Source: <http://www.careercast.com/jobs-rated/2012-ranking-200-jobs-best-worst>



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Mathematics is an **ART** and a **SCIENCE**

=

Mathematics is **BEAUTIFUL** and **USEFUL**



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- Kepler Conjecture,
or *How to Pack
Oranges as Tightly
as Possible*





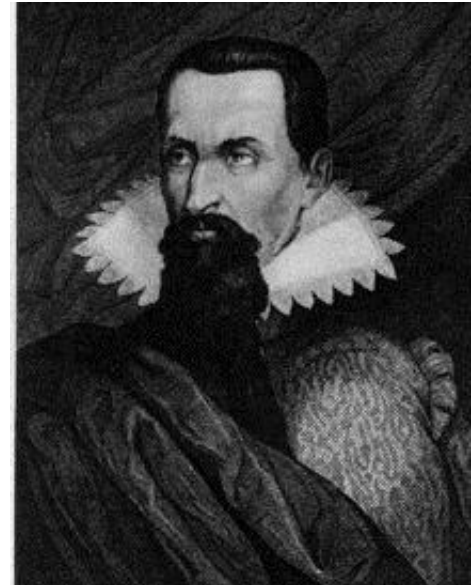
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Johannes Kepler conjectured in 1611 that this “hexagonal packing” is the best possible.

The hexagonal packing fills slightly more than 74% of space.

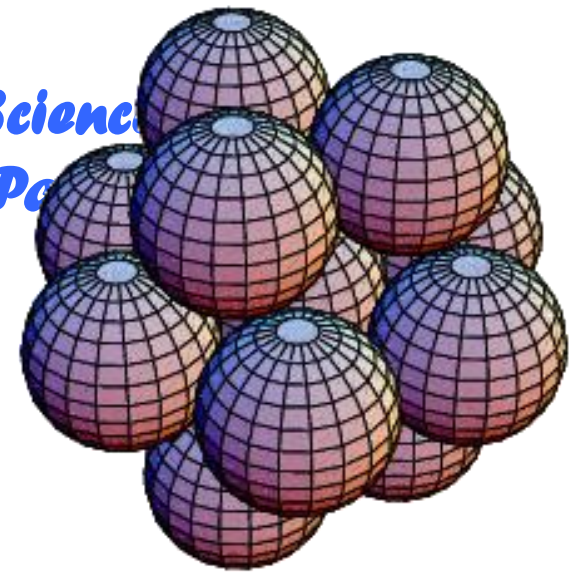
“The packing will be the tightest possible, so that in no other arrangement could more pellets be stuffed into the same container.”

Johannes Kepler (1571-1630)





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- The Kepler Conjecture was finally proved by Thomas Hales (Univ. of Pittsburgh) in **2002**, making extensive use of computer calculations
- Applications of sphere packing to “packing” telephone calls on glass fiber cables



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- **Fourier Series**

- In **1807**, Joseph Fourier invented *Fourier Series* to solve the Steady-State Heat Equation, one of the most important equations in Physics.

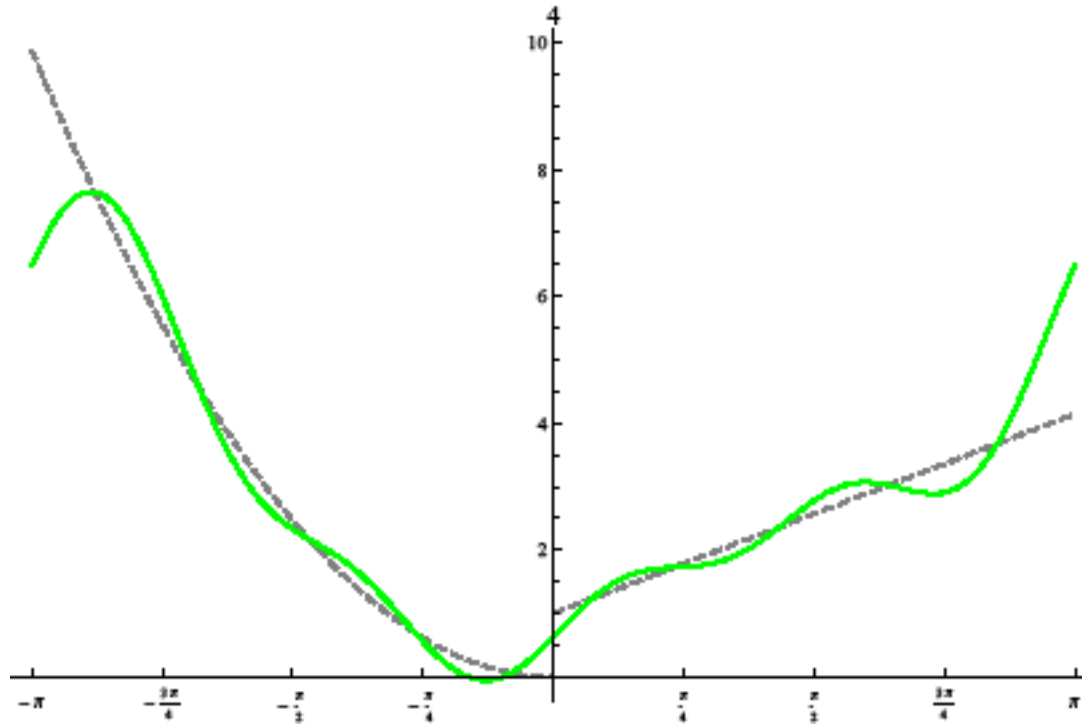


“Heat, like gravity, penetrates every substance of the universe, its rays occupy all parts of space. The object of our work is to set forth the mathematical laws which this element obeys. The theory of heat will hereafter form one of the most important branches of general physics.”

Joseph Fourier (1769-1830)



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A *Fourier Series* (green) is a sum of trigonometric functions that approximates a given function (dashed).



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- Today the *Fast Fourier Transform* is the major ingredient for the compression algorithms used in JPEG (images), MP3/4 (sound and video) files.
- The new JPEG2000 standard for image compression will use mathematical techniques pioneered by Ingrid Daubechies (Princeton Univ.) and others starting in the **1980s**.



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