

# Leonhard Euler



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# Euler's Life:

Lived from 1707 – 1783

Lived to be 76 years old

Life expectancy was 35-40

Born in a small town outside of Basel, Switzerland

Father – Paul Euler

Mother – Marguerite Brucker

**BASEL!!!**



# Euler's Life:

Euler had two sisters

Anna Maria and Maria Magdalena

His father was a Protestant clergyman

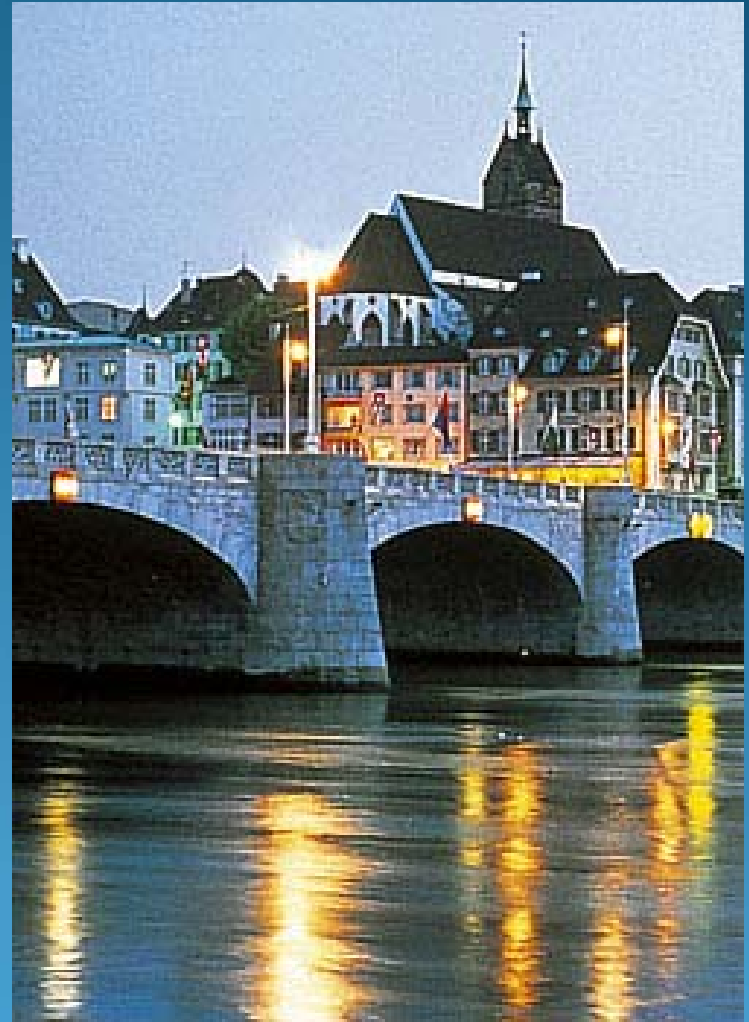
His mother was born and raised to a pastoral family



# Euler's Life:

At the age of 14 Euler entered the University of Basel  
There he studied under Johann Bernoulli

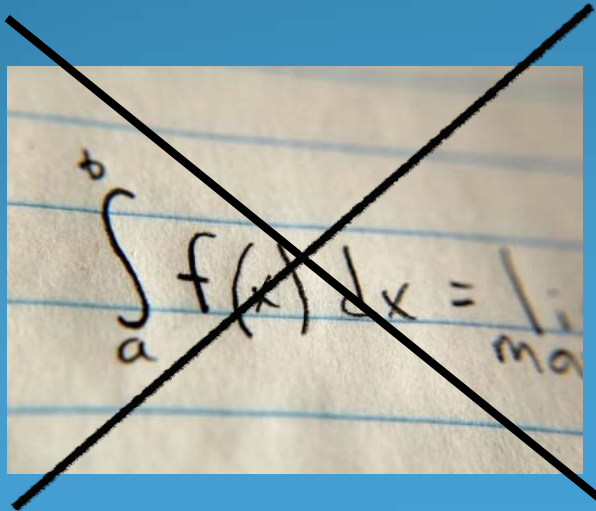
Bernoulli took Euler under his wing and the two men discussed subjects from Philosophy to Mathematics



# Euler's Life:

While at the University, Euler wasn't bound to mathematics

He actually started to study Theology much like his parents wanted him to



## thē-ōl'ə-jē

**theology:** n., pl. - *gies*. 1. The study of the nature of God and religious truth; rational inquiry into religious questions, esp. those truths posed by an organized religious community. 2. An organized, often formalized, body of opinions concerning God and man's relationship to God. 3. A course of specialized religious study.

noun usage:

*Theology is the science of living blessedly forever.*  
(William Perkins)

*Theology is doctrine or teaching of living to God.*  
(William Ames)

# Euler's Life:

By 20, he had earned recognition in the realm of science

He was recognized for his analysis of placement of masts on sailing ships



# Euler's Life:

In 1725 Johann's son, Daniel took a mathematics position at St. Petersburg Academy and asked Euler to join him



Unfortunately the only position Euler could obtain was in physiology and medicine

Jobs were scarce – so he took what he could get

# Euler's Life:

## SIDENOTE:

Euler had no idea what physiology and medicine was at the time!!!

Would you have wanted him treating you for whatever problems you were having in the 1700s??????????

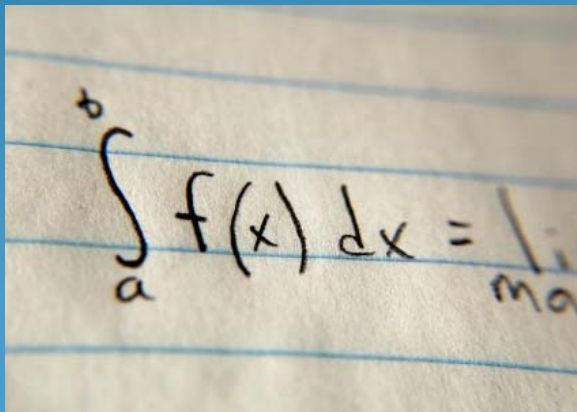
# Euler's Life:

He was reassigned to the Physics department!!

Nearly a decade later, Daniel Bernoulli left his position

Down side – Euler lost a good friend

Up side – the mathematics position he always wanted was now available



A photograph of a piece of lined paper with a handwritten mathematical formula. The formula is the definite integral of a function f(x) from a to b, which is equal to the limit as n approaches infinity of the sum of the function evaluated at the midpoint of each subinterval. The formula is written as: 
$$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f\left(\frac{a + (i-1)\Delta x}{2}\right) \Delta x$$



SWEET!!!

# Euler's Life:



He had the experience he always wanted, the job, now he needed to get the girl

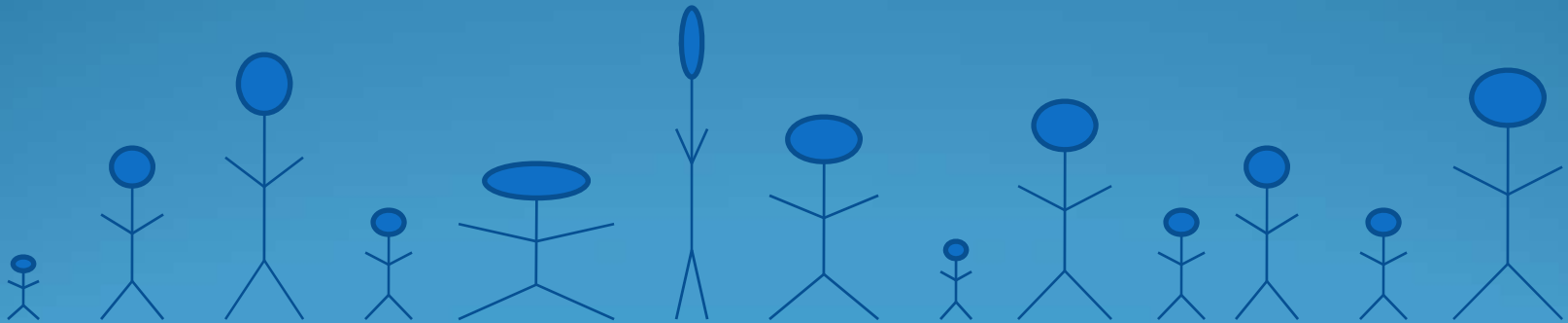
Euler married Katharina Gsell (N/A - 1773)

Daughter of a Swiss painter living in Russia at the time

# Euler's Life:

Over four decades of a happy marriage the two had THIRTEEN children

Only five survived into adulthood and of them three outlived their parents



# Euler's Life:

Let's move onto the math now shall we...

One of Euler's original accomplishments was being able to find the exact value of the infinite series

$$1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{25} + \dots + \frac{1}{k^2} + \dots$$

# Euler's Life:

The problem had troubled :

Pietro Mengoli (1625-1686) in 1644

Jakob Bernoulli (1654-1705) in 1689 who had proposed the problem to the mathematical society

They deemed it as unsolvable and whomever were able to solve it would be a significant role model in the realm of mathematics.

Euler became that role model in 1735

# Euler's Life:

After the Basel Problem was behind him Euler had another problem come into his sight

He started to lose his eyesight in his right eye

He blamed it on being overworked

Science thinks he had an infection he ignored around  
1738

# Euler's Life:

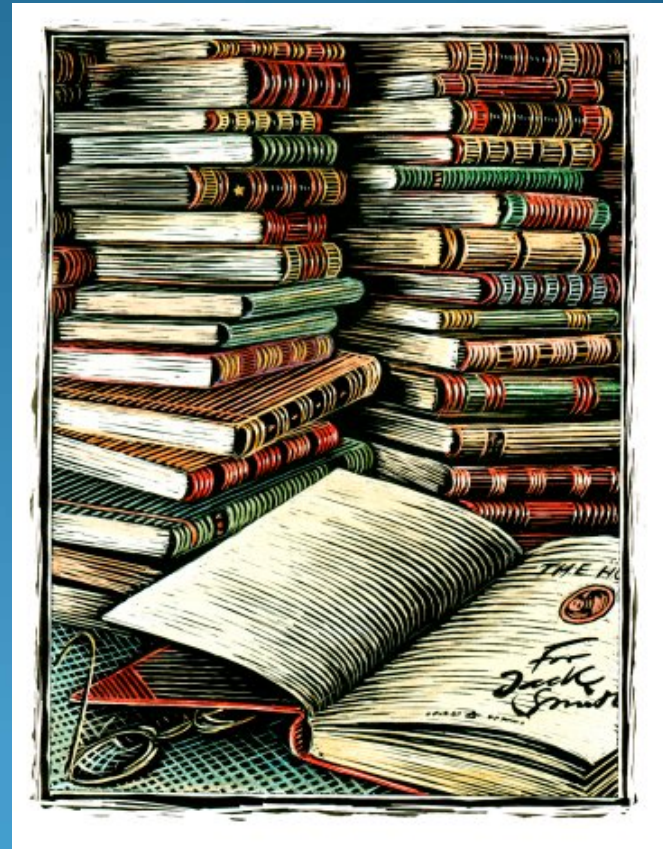
## Some of Euler's writings:

*Mechanica* – Newtonian laws of motion within Calculus

*Introductio in analysin infinitorum* – text on functions

*Institutiones calculi differentialis* – volume on differential calculus

*Opera Omnia* – collections of letters from Basel University



# Euler's Life:

In *Elements of Algebra* Euler introduced the square root of negative 1 as “...neither nothing, nor greater than nothing, nor less than nothing...”

This introduction to complex numbers led Euler to another one of his greatest proofs:

$$e^{ix} = \cos(x) + i\sin(x)$$

# Euler's Life:

It is from “these equations we understand how complex exponentials can be expressed by real sines and cosines.”

He provided alternative proofs for his magnificent solution. Euler believed in the principle that any result worth proving is worth proving again.

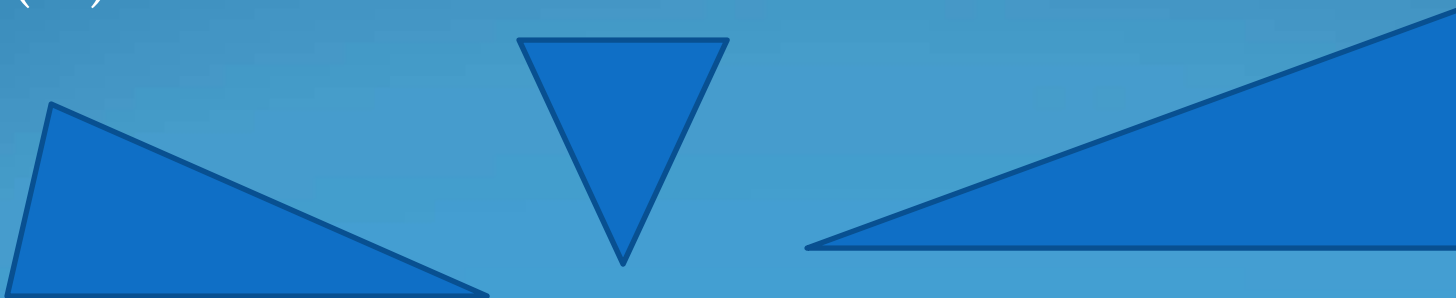
Those alternative proofs can be found in *Opera Omnia*.

# Euler's Life:

Euler also found his way in Geometry with the basis centered around Heron's Triangular Area

He wanted to take Heron's rule and make it his own

Euler discovered the "Euler line" in triangles where the orthocenter (E), the centroid (F), and the circumcenter (H) all are on the same line



# Euler's Life:

Euler found his way to Berlin, Germany when Frederick the Great (1712-1786) asked him to become a member of the newly rejuvenated Berlin Academy

It was there that Euler provided private instruction to Princess Anhalt Dessau

Euler wrote her letters over subjects such as geometry, physics, logic, language, magnetism, astronomy, sound, light, and gravity.



# Euler's Life:

These letters were eventually collected together and distributed to the general public duely named:

*Letters of Euler on Different Subjects in Natural Philosophy Addressed to a German Princess*

More than 200 letters were translated in this collection

It made its way through Germany, Europe, then into the United States in 1833, 60 years after Euler's death

# Euler's Life:

Many of Euler's greatest works were published well after his death by more than 40 years

He is considered one of the greatest mathematical minds to give insight into calculus and complex number theory

In his eulogy it was stated by Marquis de Condorcet that whoever pursues mathematics will be "guided, and sustained by the genius of Euler and all mathematicians ... are his disciples."

# Euler's Life:

## Works Cited

William Dunham. "Euler: The Master of Us All." The Mathematical Association of America.

Clifford Truesdell, "Leonhard Euler, Supreme Geometer," in Euler's *Elements of Algebra*.

Ron Calinger, "Leonhard Euler: The First St. Petersburg Years (1727-1741)," *Historica Mathematica*, Vol. 23.

Dan Kalman, "Six Ways to Sum a Series," *The College Mathematics Journal*, Vol.24, No. 5, 1993.

Euler, *Letters of Euler on Different Subjects in Natural Philosophy*, Arno Press, New York, 1975.

Euler, *Opera Omnia*, Ser. 1, Vol.19.

David Wells, *The Penguin Book of Curious and Interesting Geometry*, Penguin, New York, 1991.