

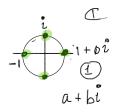
#### Leonhard Euler: 1707 - 1783

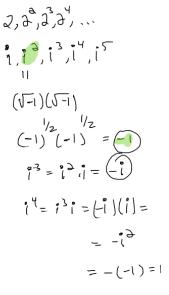
- 1. Switzerland, Russia, Berlin
- ▼2. math / phyics / astronomy / geography / engineer
  - a. created graph theory & topology
  - b. analytic number theory, complex analysis, calculus
  - ▼ c. solidified the use of mathematical notation
    - i. function notation: f(x)
    - ii. greek letter: pi
    - iii. imaginary number: i
    - iv. summation: Sigma
    - v. defined the constant e
    - vi. introduced the use of exp function & logs in proofs
    - vii. Euler's formula: exp(iz) = cos(z) + isin(z)
    - ▶ viii. Pioneered analytic methods in number theory
    - ix. hyperbolic trig functions
    - x. continued fractions
  - ▶ d. mechanics / fluid-dynamics / optics / astronomy / music theory
- ▼3. Truly one of the greatest mathematicians in history.
  - a. Laplace: "Read Euler, read Euler he is the master of us all.
  - b. Gauss: "The study of Euler's works will remail the best school for the different fields of mathematics, and nothing else can replace it.
  - ▼ c. Most prolific
    - i. 850+ publications
    - ii. 92 volumes
  - d. Graph Theory / Topology: Seven Bridges of Konigsberg
  - ▼ e. Basel Problem:
    - i. What is the sum of reciprocals of squares?
    - ▼ii. Named after the town of Basel, Switzerland
    - 1. hometown to Euler & the Bernouli's
  - f. Topology: Euler Characteristic

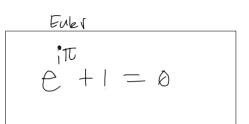
$$(\cos\theta, 8\dot{m}\theta) = (\alpha, b)$$

$$(\alpha, b)$$

$$e^{i\theta} = \cos\theta + i \sin\theta$$







X
2
2
2
2
2

	No. of	No. of Vertices	No. of Edges	regular <i>n</i> -gon	No. of faces at	No. of degrees in	No. of deg. in ea.
Name of Solid	Faces	(V)	(E)	(polygon) at	each	each face	polyhedral
	(F)			each face (n)	vertex (k)	angle	angle
Tetrahedron	4	4	6				
Cube	6	8	12				
Octahedron	8	6	12				
Dodecahedron	12	9-0	30				
Icosahedron	20	12	30				

# The Regular Solids<sup>1</sup>

### Tetrahedron



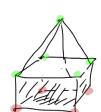


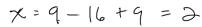




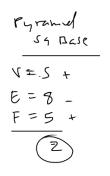








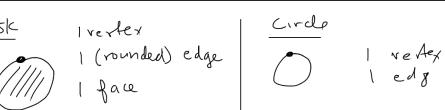




x (Square) = 4 - 4 + 1 = 1

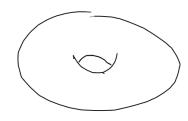


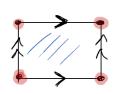




$$\chi = 6$$

## toms





$$\chi(Toms) = 1 - 2 + 1 = 0$$



form, might beglespan in whom also for made forwarded, in a common shiple forces handow memores since made in due governe. I dimensioned the state of the complete while of any mine temperature. I describe our ship fails golf weekly and governe name or primit to got amount of the complete our ship fails of any and the man walled in a consistence with stay of amount of the common and the force our consistence and stay of amount of the common of the consistence of the common o

### **Euler**

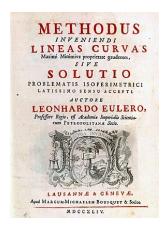
- 1. Almost a 1/3 of the math & science created in the 18th century bears his name.
- ▼2. Poor eyesight, eventually blind
  - a. but he said: "on the bright side, I have fewer distractions"
  - b. 1738: Degenerative sight in right eye
  - c. 1766: cataract in left eye, failed surgery left him almost totally blind.
- ▼3. Two students once disagreed over the result of the sum of 17 terms in a series, (their results differed in the fiftieth decimal place).
  - a. Euler computed the correct result, in his head, in a few seconds.
- Like many, disobeyed father (study religion), he took advice of Bernouilli to take up math.
- 5. It was in St. Petersburg, Russian city, on September 18, 1783, Euler was calculating the ascent of hot air balloons—which at that time were causing a furore in Europe—and argued over dinner with his colleague Anders Johan Lexell about the orbit of the newly discovered planet `. As Condorcet wrote, it was later, while drinking tea and playing with his grandson, when "all of a sudden the pipe that he was smoking slipped from his hand and he ceased to calculate and live." ~











### **Euler's life Timeline**

- 1. Oldest of 4 children
- 2. At 13, began University of Basel
- 3. At 16, Masters of Philosophy: compared philosophies of Descartes & Newton
- ▼ 4. At 20, entered Paris Academy prize competition
  - ▼ a. What's the best way to place the masts on a ship?
    - i. Took 2nd place behind Pierre Bouguer father of naval architecture
  - b. Euler entered this competition 15 times (winning 12)
- ▼5. At 20, worked Russian Academy of Sciences with Daniel Bernouilli (replacing Nicolaus)
  - a. Mastered Russian
  - b. Medic in Navy
  - c. Had long post at the Academy (physics, math)
- ▼ 6. 1734 (At 28) married Katharina Gsell
  - a. 13 children, only 5 survived childhood
- ▼7. 1741 (At 34) left Russia
  - a. Berlin Academy
- ▼8. 1748 (At 41) Text: Introductio in analysin infinotrum
  - a. Foundations of mathematical analysis
  - 9. 1755 (At 48) Text: Differential Calculus
- ▼ 10. 1755 (At 48)
  - a. Member of Royal Swedish Academy of Sciences
  - b. French Academy of Sciences
- ▼ 11. Early 1760's
  - ▼ a. 200 letters that became
    - i. Letters of Euler on different Subjects in Natural Philosophy Addressed to a German Princess



- iii. The popularity of these Letters testifies to Eulers teaching ability (a rarity)
- ▼ 12. 1773 (At 64) His wife died
  - a. 3 years later he married her half sister Salome Gsell.



### What was Euler not?

▼1.?

- a. He was not Voltaire.
- b. Euler was a simple, devoutly religious man who never questioned the existing social order or conventional beliefs
- c. He was not a skilled debater.