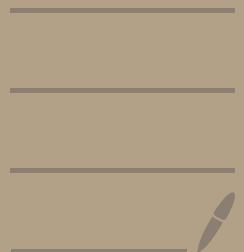


L27 - 08/11/2024

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## Characteristics of Leibniz's Math

1. His strength was identification of concepts as against their technical devp.

eg - Notations :  $d/dx$  &  $\int$

2. Introduced the word 'function'  
algebraic v/s transcendental

3. Preferred closed form rather than infinite series.

From his perspective,  $\int f(x) dx$  involved finding a  $fx^n$   $F$  (antiderivative) s.t.  
 $F' = f$

- The search for such closed forms lead to a 'wild goose chase' but, integration of rational  $fx^n$ 's lead to factoring of polynomials.

- Integration of  $\int \frac{dx}{\sqrt{1-x^4}}$  lead to the  
theory of elliptic curves

## Newton

- Born : 1642 in Woolsthope, Lincolnshire, England
- Tough early years
- Initial interest in Mechanics such as windmills, later academics
- Entered Trinity College, Cambridge ~ 1661 as a 'sizar'  
(students who earn their keep by serving wealthier students)
- Early studies : Aristotle, Descartes
- By 1664, he prepared notes 'Questiones Quaedam Philosophicae'.  
Mechanics, Optics & philosophy of vision
- 1665: Plague in England  
Newton returned to Woolsthope & was absorbed in research
- 1664 to 1666: Most creative period  
for Newton his first papers appeared  
(De Analysi, De Methodis)

- 1669: Lucasian Professor of Mathematics
- 1687: Principia Mathematica  
Theory of gravitation, elliptic loci of orbits

### Leibniz

- Born: 1646, Leipzig, Germany
- Both parents were academics
- Access to father's library
- At 15, University of Leipzig & doctorate from Altdorf in law 1666.
- 1663: Visited Jena, Germany  
studied Euclid
- 1672 - 1676: Crucial in Math
  - Pascal's triangle  $\sim$  1666
  - Met Huygens

$$\sum_{n=1}^{\infty} \frac{1}{n(n+1)} = \sum_{n=1}^{\infty} \frac{1}{n} - \frac{1}{n+1}$$

$$- 1673: \pi/4 = 1 - 1/3 + 1/5 \dots$$

$$1/2 \log(2) = \frac{1}{2 \cdot 4} + \frac{1}{6 \cdot 8} + \dots$$

- De Arte Combinatoria ~ 1666
  - Systematically deduce all true statements
  - Identified by Leibniz & later developed by Hilbert, Gödel ..
- Again, did not delve 'deep' into these but identified these concepts.