

Matematik: Videnskaben om det uendelige

3

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På vej ud af den græske tradition

- De velkendte matematiske spørgsmål:
 - Arealer og volumner
 - Tangenter
- Nye metoder
- Nye objekter

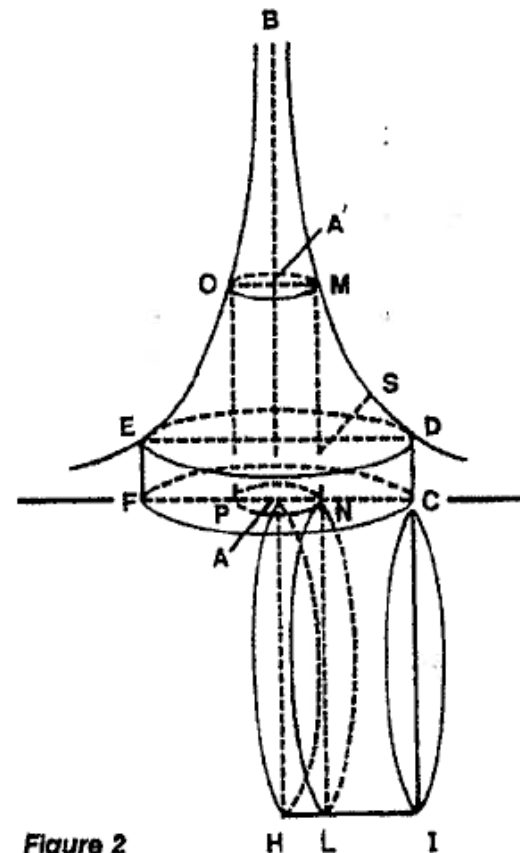
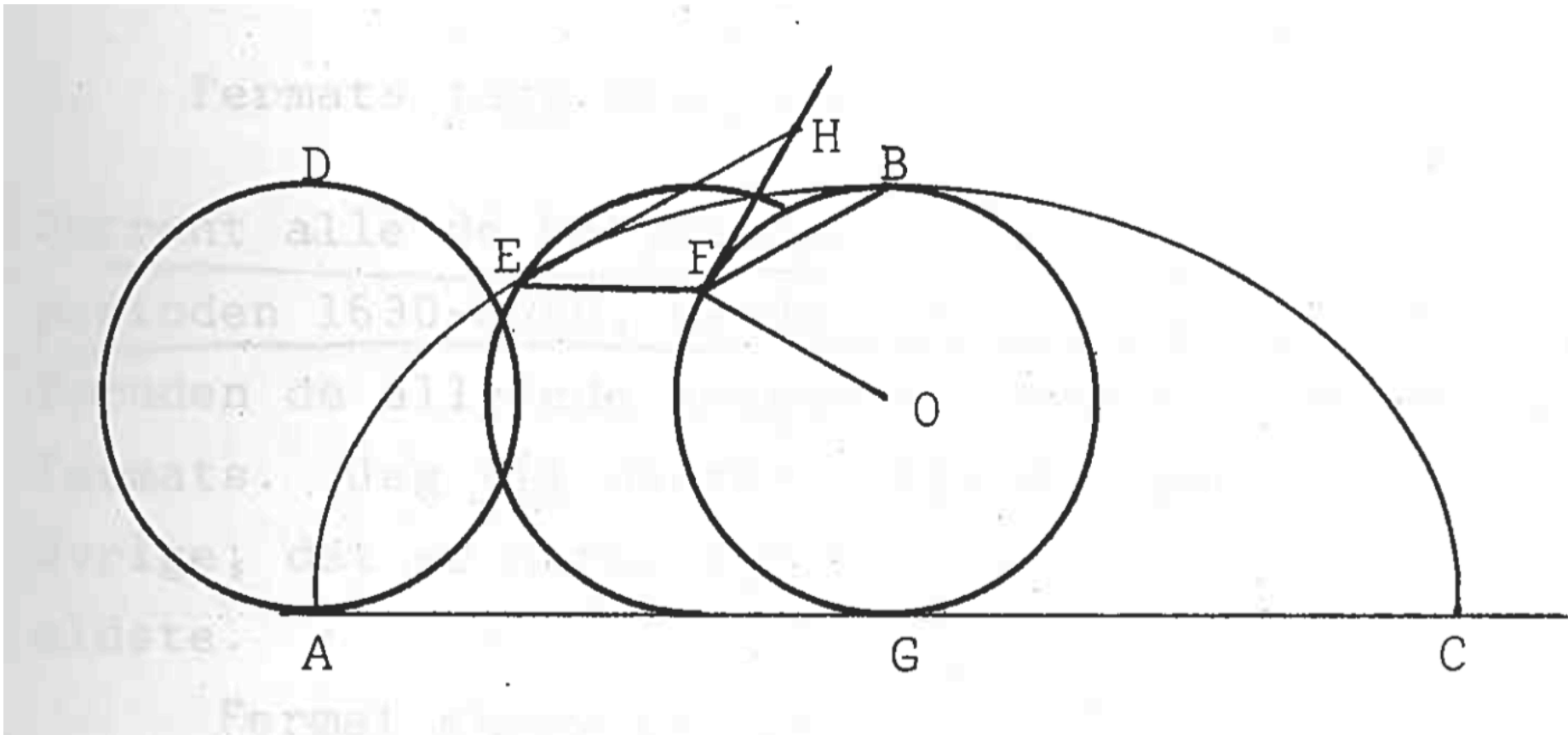


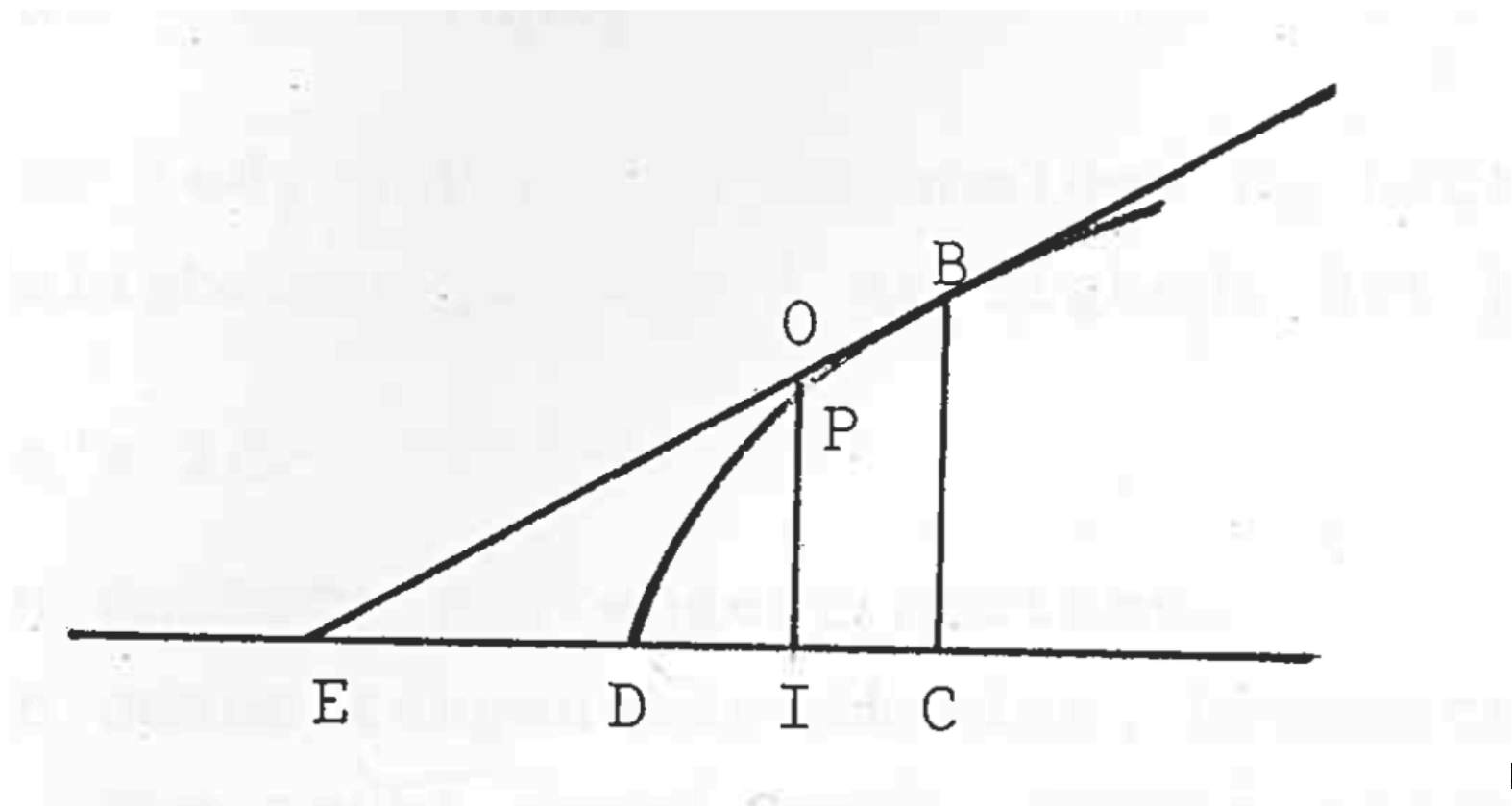
Figure 2

Gilles Personne de Roberval (1602-75), – Tangentmethode



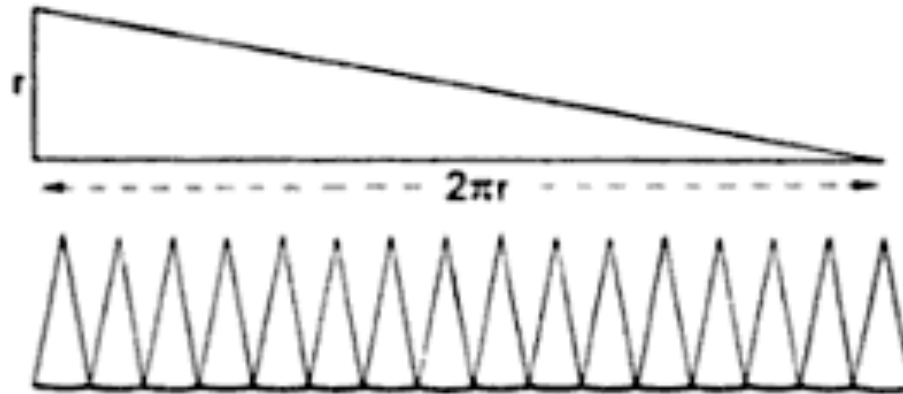
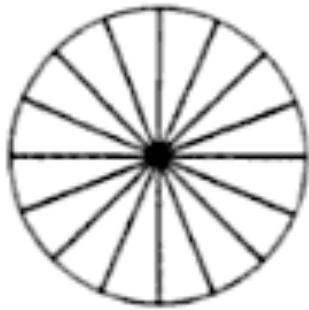
Pierre de Fermat (1601-65)

– Tangentmethode

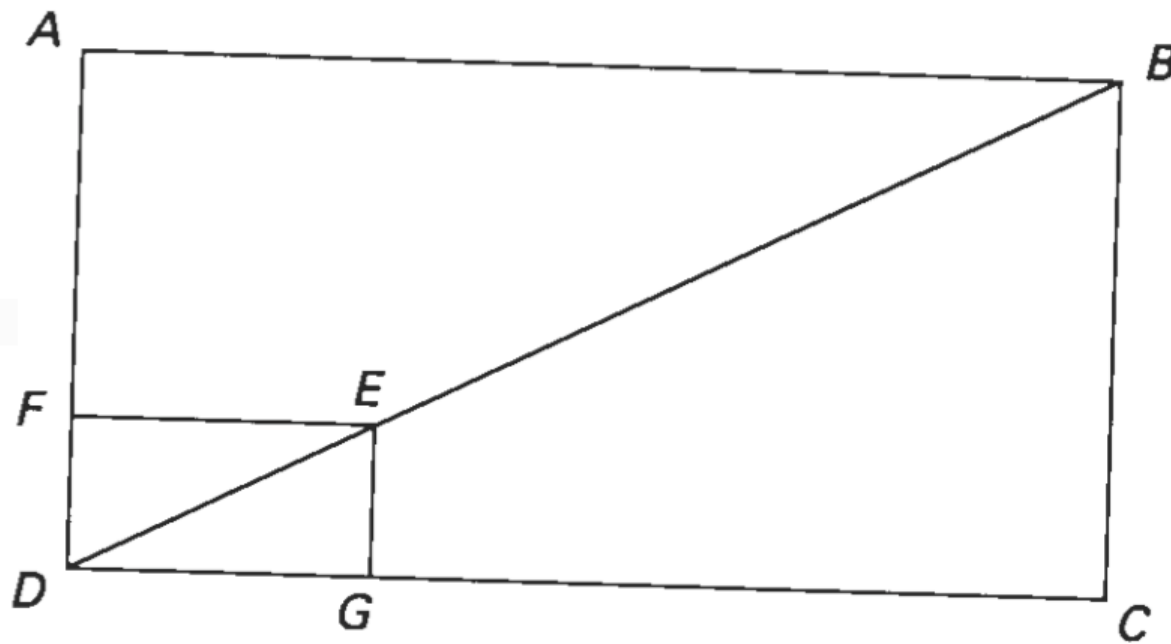


Lad os gå tilbage til areal- og volumen-
metoderne

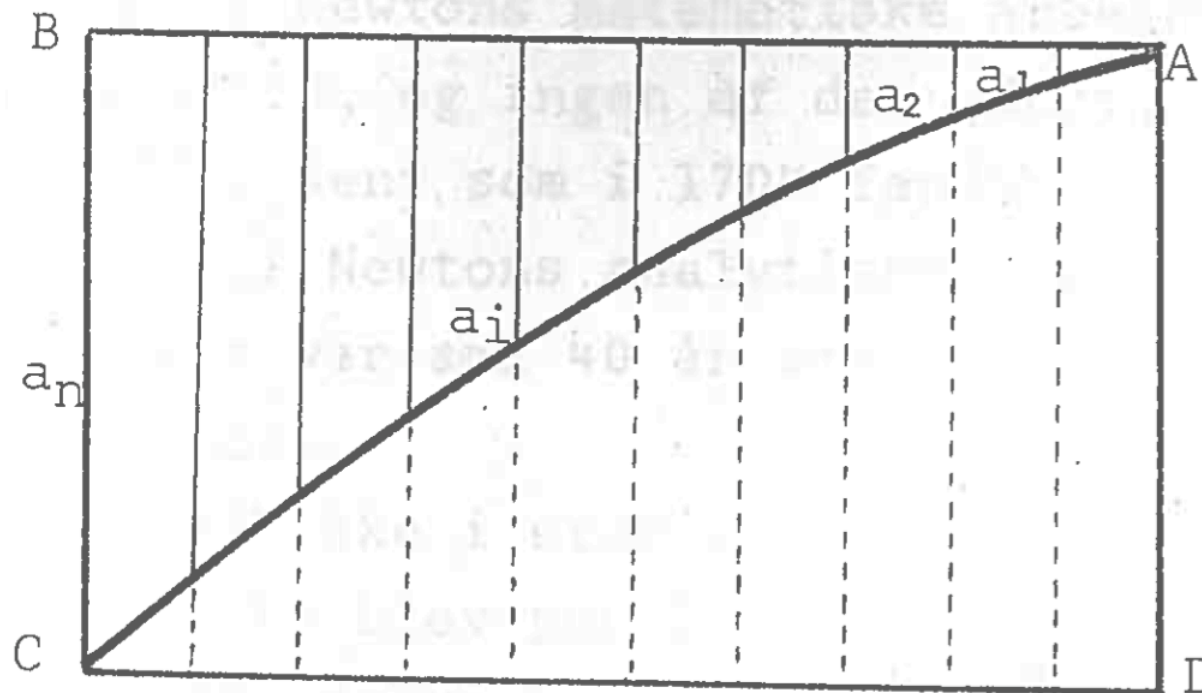
Kepler



Problemer med de udelelige: Havde de bredde eller ikke?

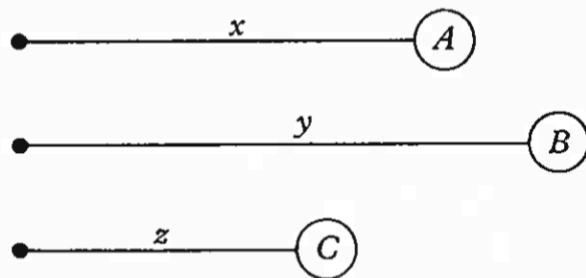


Roberval og Fermat om kvadraturer af parabler og hyperbler



Newton's 1666-traktat

7 Haveing an Equation expressing y^e relation twixt two or more lines



x, y, z &c: described in y^e same time by two or more moveing bodys $A, B, C,$ &c: the relation of their velocityys $p, q, r,$ &c may bee thus found, viz:

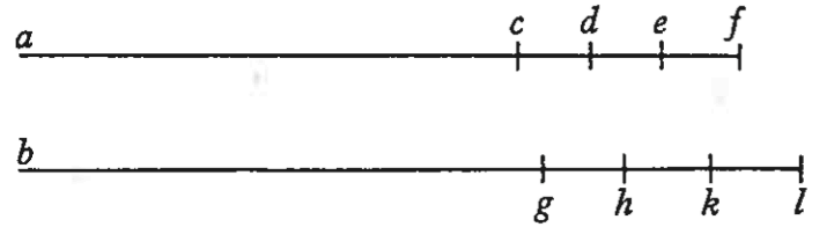
Set all y^e termes on one side of y^e Equation that they become equall to nothing. And first

multiply each terme by so many times $\frac{p}{x}$ as x hath dimensions in y^t terme.

BUT Y^e DEMONSTRATIONS OF W^h HAVE BEEN SAID MUST NOT BEE WHOLLY OMITTED.

Prop 7 Demonstrated.⁽⁴⁵⁾

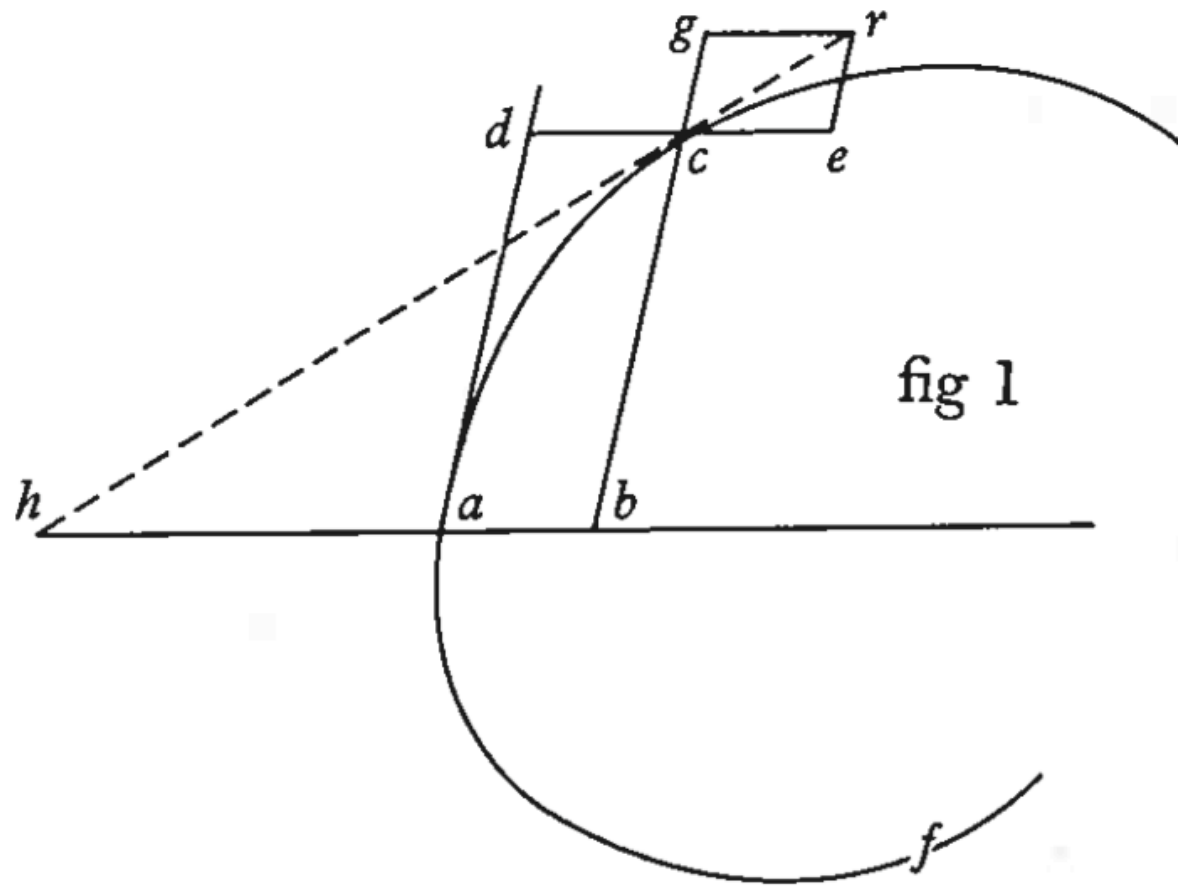
Lemma. If two bodys *A, B*, move uniformly y^e one from *a* to *c, d, e, f*, &c: in other from *b* to *g, h, k, l*,



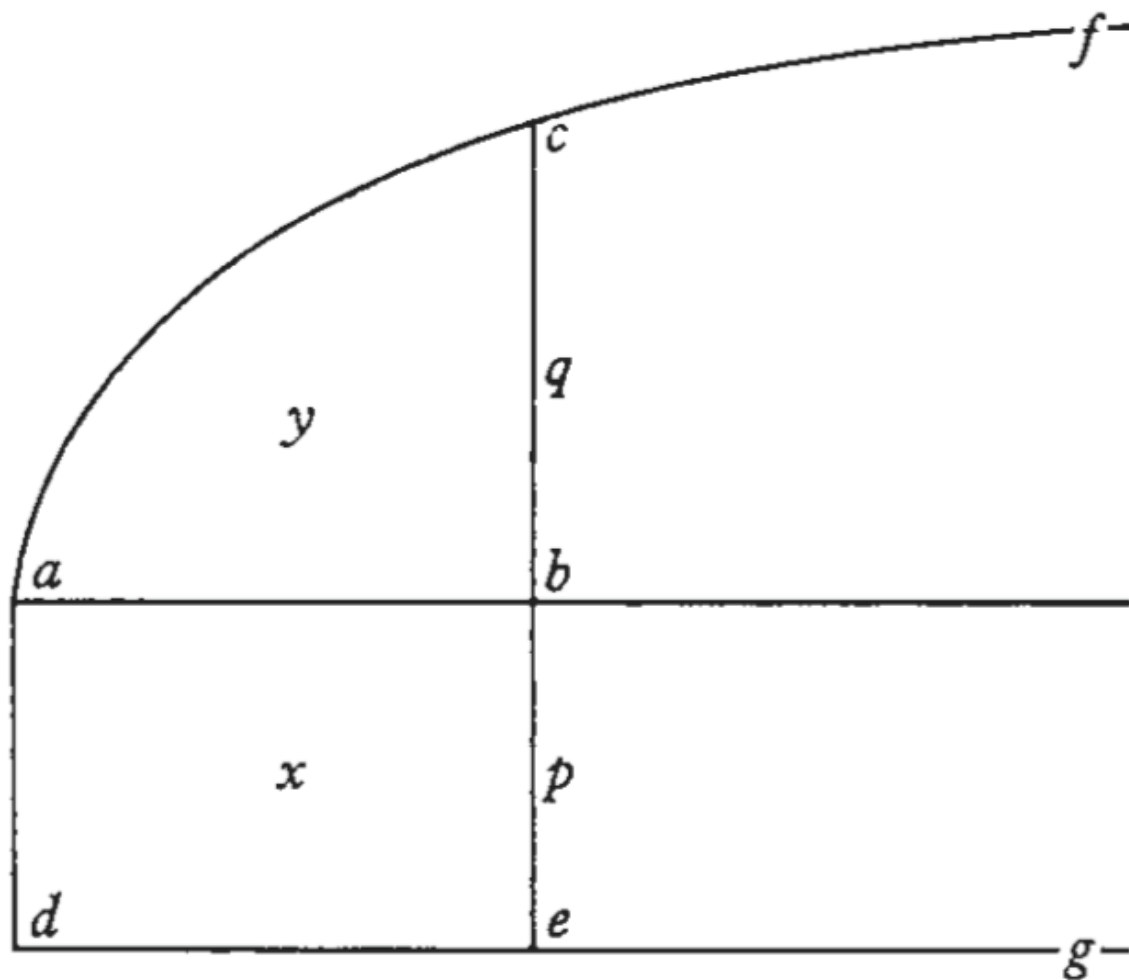
y^e same time. Then are y^e lines *ac*, & *cd*, & *de*, & *ef*, &c: as their velocitys $\frac{p}{q}$. And though they move not uniformly yet

are y^e infinitely little lines w^{ch} each moment they describe, as their velocitys w^{ch} they have while they describe y^m. As if y^e body *A* wth y^e velocity *p* describe y^e infinitely little line (*cd*=) $p \times o$ in one moment, in y^t moment y^e body *B* wth y^e velocity *q* will describe y^e line (*gh*=) $q \times o$. For $p:q::po:qo$. Soe y^t if y^e described lines bee (*ac*=) *x*, & (*bg*=) *y*, in one moment, they will bee (*ad*=) $x + po$, & (*bh*=) $y + qo$ in y^e next.

Anvendelser af prop 7



Anvendelser af prop 7



The prime and the ultimate ratio

- "I do not here consider Mathematical Quantities as composed of Parts *extreamly small*, but as *generated by a continual motion*. Lines are described, and by describing are generated, not by any apposition of Pars, but by a continual motion of Points" (MW, p. 141)
- "Fluxions are very nearly as the Augments of the Fluents, generated in equal but infinitely small parts of time, and to speak exactly are in the *Prime Ratio* of the nascent Augments, but they may be expounded by any Lines that are proportional to them". (MW, p. 141)

Var Newton unik?

- Tangentmetoder
 - Descartes, Hudde, Roberval, Torricelli, Fermat, Mersenne ...
- Areal- og volumen-metoder
 - Cavalieri, Kepler, Torricelli, Roberval, Fermat,...
- Newton forenede, generaliserede og placerede det i en teori

Var Newton unik?

- James Gregory (1638-75)
 - Elev af Torricelli
 - Ved Sct. Andrews og Uni. of Edinburgh
- Isaac Barrow (1630-77)
 - Lærer til Newton
- Leibniz (1646-1716)
 - Uafhængig af Newton

George Berkeley (1685- 1753)

The Analyst (1734)



Berkeley, George
W. Pease
1776.

THE
ANALYST;
OR, A
DISCOURSE
Addressed to an
Infidel MATHEMATICIAN.
WHEREIN
It is examined whether the Object, Principles, and Inferences of the modern Analysis are more distinctly conceived, or more evidently deduced, than Religious Mysteries and Points of Faith.
By the AUTHOR of *The Minute Philosopher*.
George Berkeley
The SECOND EDITION,
First cast out the beam out of thine own Eye; and then shalt thou see clearly to cast out the mote out of thy brother's eye.
S. Matt. c. vii. v. 5.
L O N D O N:
Printed for J. and R. TONSON and S. DRAPER
in the *Strand*.
M D C C L I V.