

BO1.1. History of Mathematics

Sheet 1 — HT23

Reading Course: Reading and Essays

Under the headings below, I set out the reading required as preparation for the classes each week. There will be two essays to complete during the term, to be handed in on the **Mondays of weeks 4 and 7**: please see the further details below. Details of the assessed extended essay will be sent out to you on the Monday of week 7. We will be able to discuss this a little in the class in week 7, but then the class in week 8 will be given over entirely to discussion and advice about the extended essay.

In addition to the sources outlined in the vacation reading sheet, the reading specified below is also drawn from the following:

- Jacqueline Stedall, *Mathematics emerging: a sourcebook 1540–1900*, Oxford: Oxford University Press, 2008.
- John Fauvel and Jeremy Gray, *The history of mathematics: a reader*, Basingstoke: Macmillan, 1987.
- René Descartes, *La géométrie*, translated into English by David Eugene Smith and Marcia L. Latham as *The geometry of René Descartes*, Chicago; London: The Open Court, 1925; reprinted by New York: Dover Publications, 1954.
- D. T. Whiteside (ed.), *The mathematical papers of Isaac Newton*, volume II: 1667–1670, Cambridge: Cambridge University Press, 1968.

Week 1: introduction to Newton's text

See the vacation reading sheet.

Week 2: setting up equations

Preliminary reading

Mathematics emerging:

- §2.3.1 (Viète on analysis);
- §2.3.3 (Descartes's method).

Main reading

Newton, *Universal arithmetick*:¹

- pp. 67.3–70.1 (equations);
- pp. 72–74 (arithmetic questions);
- pp. 75–85: note the topics covered and the level of difficulty without necessarily studying the problems in full detail;
- pp. 86–95 (geometric questions);
- pages 96–101: note the topics covered and the level of difficulty without necessarily studying the problems in full detail;
- pp. 102–189: note the topics covered and the level of difficulty; examine the following problems in detail and be prepared to discuss them in the class:
 - Problem V;
 - Problem XXIII (on which, see also Fauvel & Gray, *Reader*, §§11.A4, 11.A6);
 - Problem XXIX;
 - Problem XXX;
 - Problem XXXII;
 - Problem XLIII;
 - Problem LVI.

Week 3: how are equations are to be solved

Preliminary reading

- Descartes, *La géométrie*, English translation, pp. 158–167.

Main reading

Newton, *Universal arithmetick*:

- pp. 190–208;
- pp. 220.4–224.

¹In what follows, the notation ‘p. *N.m*’ means ‘page *N*, paragraph *m*’.

Essay

How does Newton's *Arithmetica universalis* reflect his teaching and research in algebra and other subjects from the late 1660s onwards? Does the book tell us anything about Newton's changing attitudes to algebra during this period?

(2000–2500 words, to be handed in by 5pm on Monday of week 4)

Week 4: Maclaurin, part 1

Preliminary reading

- *Mathematics emerging*, §3.2.4 (Mercator's series);
- Newton, 'De analysi', *Mathematical papers*, volume II, pp. 212–217.

Main reading

Maclaurin's *Treatise of algebra*:

- Part I: chapters I, V, VIII, XII;
- Part II: chapters I, II, III, V, VII.

Week 5: Maclaurin, part 2

Preliminary reading

- Newton's numerical method, *Mathematical papers*, volume II, pp. 218–223.

Main reading

Maclaurin's *Treatise of algebra*:

- Part II: chapters X, XI, XII.

Further reading

- 'A Letter from Mr. Colin Mac Laurin, Professor of Mathematicks at Edinburgh, and F.R.S. to Martin Folkes, Esq; V. Pr. R. S. concerning \mathcal{A} Equations with Impossible Roots', *Philosophical Transactions* 34 (1726–1727), 104–112;

- 'A Second Letter from Mr. Colin Mc Laurin, Professor of Mathematicks in the University of Edinburgh and F.R.S. to Martin Folkes, Esq; Concerning the Roots of Equations, With the Demonstration of Other Rules in Algebra; Being the Continuation of the Letter Published in the *Philosophical Transactions*, No 394', *Philosophical Transactions* 34 (1729–1730), 59–96;
- George Campbell, 'A Method for Determining the Number of Impossible Roots in Adfected \mathbb{A} Equations', *Philosophical Transactions* 35 (1727–1728), 515–531.

Week 6: Saunderson

Main reading

Saunderson's *Elements*:

- Volume I
 - Advertisement and subscription list;
 - Memoirs of the life and character of Dr Nicholas Saunderson;
 - pp. 49–50, 105–107; Advertisement on p. 139;
 - pp. 213–215, 258.2–260.
- Volume II
 - pp. 496–500 (algebra applied to geometry);
 - pp. 536–539 (problem 19);
 - pp. 563.2–568 (problem 23);
 - pp. 647–653 (divisors);
 - pp. 662.3–664.1 (roots of binomials);
 - pp. 676–691 (equations).

Essay

Why did Maclaurin and Saunderson think it necessary to elucidate Newton's *Arithmetica universalis*? What did each choose to emphasise? How well do you think they succeeded?

(2000–2500 words, to be handed in by 5pm on Monday of week 7)

Week 7

Main reading

- Euler, 'Demonstratio gemina theorematis Neutoniani';
- Euler, 'Nouvelle méthode d'éliminer les quantités inconnues';
- Lagrange, 'Sur la résolution des équations numériques' (English translations of selected parts to be provided).

Week 8

No reading is assigned for week 8: the class in week 8 is given over entirely to discussion of the extended essay.