

Mathematics 3820H – Mathematics from medieval to modern times

TRENT UNIVERSITY, Fall 2020

Instructor

Stefan Bilaniuk (pronounced Стефан Біланюк)

office: GCS 337

hours: Weekdays 11:00-11:50

or by appointment, or just drop by!

phone: 705 748-1011 x7474

home: 705 742-7862 [Do not call between 9 p.m. and 8 a.m. unless it's an emergency.]

e-mail: sbilaniuk@trentu.ca [If it's important, please call or see me in person.]

web: euclid.trentu.ca/math/sb/

Department of Mathematics

Colleen Berrigan

office: SC 327

hours: Weekdays 08:30-16:30

phone: 705 748-1011 x7715

e-mail: math@trentu.ca

Prerequisites

Prerequisite: Mathematics 1120H

Recommended: Mathematics 2200H or Mathematics 2350H

Text

A Short Account of the History of Mathematics (4th Edition), by W. W. Rouse Ball, 1908.

A version (in pdf and in T_EX) is available online (for free!) from Project Gutenberg at:

<http://www.gutenberg.org/etext/31246>

Additional readings will be assigned from other sources distributed in class or available online. Please see the handout *Readings & Schedule* for a tentative week-by-week schedule.

Meetings – take the timetable with a grain of salt:

Lectures will be pre-recorded and posted to Blackboard. The lecture times given in the timetable may be used for other purposes, such as office hours.

Seminars will occur at the time given in the timetable – Tuesday 14:00-14:50 – via teleconferencing (probably Zoom) and will focus on answering questions about the material and the assignments. (These will not be recorded.)

Marking Scheme

There will be at least six assignments, a project (which may be a solo or group project), and a take-home final examination. The final mark will be calculated as follows:

Best 5 assignments (5 @ 7% ea.)	35%
Project proposal	4%
Project	30%
Final examination	31%

Assignments will not normally be accepted after the due date. Students who cannot submit work on time for reasons beyond their control should contact the instructor as soon as possible. Note that work worth at least 25% of the course will be marked and returned by the final date (Tuesday, 10 November) to withdraw from Fall term half-courses without academic penalty.

This scheme may be modified for students in *exceptional* circumstances. Any such modification will require the agreement of both the student and the instructor.

Learning Outcomes

MATH 3820H is a survey of the development of mathematics in India, the Middle East, and Europe from medieval times to the modern era, with particular attention to the development and spread of the Hindu-Arabic number system, algebra, and the eventual development of calculus. Students will be exposed to the problem of interpreting the available data (*e.g.* the priority dispute concerning the invention of calculus), and will read portions of several original sources in translation. In rough chronological order, we will consider the development of mathematics in:

1. Ancient and medieval India
2. The medieval Islamic world
3. Medieval, Renaissance, and modern Europe

Academic Integrity

Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offence and carries penalties varying from a 0 grade on an assignment to expulsion from the University. Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent University's Academic Integrity Policy. You have a responsibility to educate yourself – unfamiliarity with the policy is not an excuse. You are strongly encouraged to visit Trent's Academic Integrity website to learn more – www.trentu.ca/academicintegrity

For clarity, the following guidelines will apply in MATH 3820H:

You are permitted and encouraged to work together and ask anyone willing (especially the instructor!) for explanations, hints, and suggestions on the assignments and projects, and to consult whatever sources you wish, with the exception that **you may not consult anyone who has taken a similar course recently or their work**. However, **all work submitted for credit must be written up entirely by you** (with the exception of group projects), **giving due credit to all relevant sources of help and information**. The restrictions for the take-home final exam will be spelled out on the exam. Except as noted on particular assignment questions, and with the restrictions noted above, you may use whatever aids you wish.

Access to Instruction

It is Trent University's intent to create an inclusive learning environment. If a student has a disability and/or health consideration and feels that he/she may need accommodations to succeed in this course, the student should contact the Student Accessibility Services Office (SAS), Blackburn Hall Suite 132, 705 748-1281, accessibilityservices@trentu.ca. For Trent University in Oshawa Student Accessibility Services Office contact 905 435-5102, ext. 5024. Complete text can be found under Access to Instruction in the Academic Calendar.

Web Page

Handouts and various materials used in previous iterations of the course – many of which are being reused in this iteration – can be found on the archive page at:

<http://euclid.trentu.ca/math/sb/3820H/>

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Readings & Schedule

The schedule below is firm, barring unforeseen events and necessities, for due dates and such, but it is a polite fiction so far as progress through the content of the course is concerned – no lesson plan survives contact with students! – and our actual pace, and perhaps the additional readings, will be adjusted as necessary. The skeleton of our readings is from the text:

A Short Account of the History of Mathematics (4th Edition), by Walter W. Rouse Ball, 1908.

It is available online (pdf and T_EX) from Project Gutenberg at:

<http://www.gutenberg.org/etext/31246>

The text is somewhat dated in style and content, and is, in any event, intended as a relatively sparse outline. The skeleton it provides will be fleshed out in the lectures and with readings from various sources, original and otherwise, available on line. Please note that the readings and additional sources given below are potentially subject to change. They will be posted to Blackboard, but links to where they were obtained from are also given below.

Week 0. (*10–11 September*) Please read pp. 120-129 in Chapter IX of the text.

Week 1. (*14-18 September*) Please read pp. 1-8 & 21-50 of the *Āryabhatīya*, by Āryabhata, trans. by W.E. Clark, Univ. of Chicago Press, Chicago, 1930. It can be found online at:

<http://www.wilbourhall.org/pdfs/aryabhatiyaEnglish.pdf>

Week 2. (*21–25 September*) Please read pp. 129-135 in Chapter IX and pp. 136-137 in Chapter X of the text, and pp. 1-21 of *The Algebra of Mohammed ben Musa* [*i.e.* al-Kwarizmi], ed. and trans. by Frederic Rosen (London, 1831), which can be found (pdf) online at:

http://www.wilbourhall.org/pdfs/The_Algebra_of_Mohammed_Ben_Musa2.pdf

- Assignment #1 due on 25 September.

Week 3. (*28 September – 2 October*) Please read pp. 109-119 in Chapter VIII and pp. 138-164 in Chapters X-XI of the text.

Week 4. (*5–9 October*) Please read pp. 165-189 in Chapter XII of the text and pp. 207–276 of *Jerome Cardan: The life of Girolamo Cardano, of Milan, physician*, Vol. I, by Henry Morley (London, 1854), which can be found (pdf and epub) online at:

<http://books.google.ca/books?id=lskVAAAAYAAJ>

- Assignment #2 and project proposal due on Friday, 9 October.

Week 5. (*12–16 October*) Please read pp. 189-201 in Chapter XII of the text and all of the *History of the Invention of Logarithms*, an appendix (pp. 435-507) in *Memoirs of John Napier of Merchiston*, by Mark Napier (London, 1834), which can be found (pdf and epub) online at:

<http://books.google.ca/books?id=husGAAAAYAAJ>

[Chapters IX-X (pp. 328-434) of this book give a more detailed account of Napier's part in the invention of logarithms, and may be worth a look too.]

Week 6. (*19–23 October*) Please read pp. 202-210 in Chapter XIII of the text and pp. 153-187 of *Dialogues Concerning Two New Sciences*, by Galileo Galilei, trans. by H. Crew & A. de Salvio (MacMillan, New York, 1914), which can be found (pdf, epub, & other formats) online at:

<http://openlibrary.org/works/OL15231447W>

- Assignment #3 due on Friday, 23 October.

Reading Week. (26–30 October) Enjoy reading something else, and work on your project!

Week 7. (2–6 November) Please read pp. 210-237 in Chapters XIII-XV of the text and all of the *Essay on Conics*, by Blaise Pascal, trans. by F.M. Clarke. This can be found in *A source book in mathematics*, Volume 1, by David Eugene Smith (Dover Publications, 1984, ISBN 0486646904); the relevant part can be found online (though not for download) at:

http://books.google.ca/books?id=awAf07Ff_z0C&pg=PA326

Week 8. (9–13 November) Please read pp. 237-290 in Chapters XV-XVI of the text.

- Assignment #4 due on Friday, 13 November. *The last date to withdraw from Fall courses is Tuesday, 10 November.*

Week 9. (16–20 November) Please read pp. 291-301 in Chapter XVII of the text and *An Account of the Book Entituled Commercium Epistolicum Collinii et Alliorum, de Aanalysisi Promota*, by Isaac Newton [writing anonymously], *Philosophical Transaction of the Royal Society of London*, No. 342, January and February 1714, pp. 173-224. This is reprinted on pp. 116-153 of *The Philosophical Transactions of the Royal Society of London, from their commencement, in 1665, to the year 1800; Abridged*, Vol. VI (London, 1809), which can be found online (pdf and epub) at:

<http://books.google.ca/books?id=t0JKAAAAYAAJ&pg=PA116>

An edition prepared by D.R. Wilkins can be found online (pdf) at:

<http://www.maths.tcd.ie/pub/HistMath/People/Newton/CommerciumAccount/>

Week 10. (23–27 November) Please read pp. 301-321 in Chapter XVII of the text and pp. 51-68 of *A Treatise of Fluxions*, Vol. I, by Colin MacLaurin (Edinburgh, 1742), which can be found online (pdf and epub) at:

<http://books.google.ca/books?id=dCA0AAAAQAAJ>

This book included MacLaurin's attempt to make the foundations of calculus rigorous in response to George Berkeley's criticisms, for which check out, if you wish, *The Analyst* [2nd edition] (London, 1754). It can be found online (pdf) at:

<http://books.google.ca/books?id=TqCZhiQdXogC>

- Assignment #5 due and the take-home final examination distributed on Friday, 27 November.

Week 11. (30 November – 4 December) Please read pp. 322-364 in Chapter XVIII of the text and pp. 54-70 & 144-157 of *Elements of Algebra* (2nd Edition), Vol. I, by Leonard Euler (trans. by ?, London, 1810), which can be found online (pdf) at:

<http://books.google.ca/books?id=hqI-AAAAAYAAJ>

Week 12. (7–9 December) Please read pp. 365-401 in Chapter XIX of the text.

- Assignment #6 due on Wednesday, 9 December. *Wednesday, 9 December is the last day of classes.*

Examination Period. (10-22 December)

- Project and take-home final examination due on Friday, 18 December.

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