

As all historians know, the past is a great darkness, and filled with echoes. Voices may reach us from it; but [. . .] try as we may, we cannot always decipher them in the clearer light of our own day. —Margaret Atwood, end of The Handmaid's Tale [1985]

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NOTE: I highly recommend e-mail as the best way to contact me (instead of phone or voice mail).
[To request a return phone call via e-mail, include a phone number and suggest several times to call.]

Prerequisite Grade of C or better in Math 307, or instructor permission.

Text *A History of Mathematics*, Victor Katz, brief edition.

Course Objectives There are many things that this course is designed to accomplish; foremost among these are:

- * *to develop a deeper understanding of the mathematical content, methods, and standards present in today's "global mathematics curriculum" through a careful study of the origins and development of that content in many separate civilizations;*
- * *to develop a sequential time sense of the development of mathematical thought over 5000 years through a careful study of important landmarks (e.g., people, problems, places) that mark this development;*
- * *to develop an understanding of the forces that shape mathematical ideas, including the influence of technology, communication, religions, schools and other social institutions, through a careful study of how mathematics has (or has not) developed in various cultures and time periods;*
- * *to develop a base of historical knowledge, research skills, and resources with which to reflect upon and converse about the nature and role of mathematics through careful reading of secondary and primary sources, participation in group discussions, reflective and research writing, oral presentations and peer evaluation.*

Because our time together is (far) too short to do justice to over 5000 years of mathematical development, class readings and discussions will focus on the general development of calculus and associated topics in algebra, analytic geometry and trigonometry from earliest times through about 1700 CE, with select topics from later work and more detailed study of particularly illustrative or interesting episodes as time permits. Individual research projects and presentations will provide highlight mathematical developments of the 18th – 20th centuries.

Since this course is required for secondary mathematics education, we will also pay some attention to examining pedagogical issues through the lens of history and to gaining experience in the interpretation of mathematical activity through the examination of original source documents.

More detail on content knowledge objectives for this course are included in the *Course Questions List*.

Course Philosophy
[& some advice] A general premise of this course is that History of Mathematics is neither history alone, nor mathematics alone. One particular consequence of this is that studying History of Mathematics requires more prose reading and writing than other math courses, and more problem solving and theorem proving than other history courses. **[Please plan your study schedules with this in mind, especially with respect to the course research project!]**

A second general premise is that History of Mathematics is more than viewing the past simply in terms of its relevance for the present. While we cannot avoid looking through our 21st century lenses as we examine the story of mathematics' past, our aim will be to consider the work of past mathematicians *on its own terms* by asking questions such as: *What did these mathematicians think they were doing? What were their goals, interests, and methods? What did they think they had accomplished? What was the broader cultural context of their work? How did their cultural context influence their work, and vice versa?*

Finally, it is assumed that your studies to date have provided you - as an upper division math major - with an understanding of certain (contemporary) mathematical concepts, as well as some practice with (contemporary) problem solving methods and proof techniques. Unless you are also an upper division history major, you are

probably less knowledgeable about (world) historical events, and less experienced in the practice of historical judgment and research methods. Both circumstances will open up new learning opportunities - and challenges - as we work to situate mathematical developments of the past within their broader scientific, intellectual, and social contexts. These opportunities and challenges have been taken into account in the design of course\grading procedures and policies.

**Course Procedures
and
Expectations**

There will be three 50-minute meeting periods each week, unless otherwise agreed and announced. (See “Presentation Proposal” under course project below concerning one possible variation in our meeting schedule.) Class time will be spent primarily in *group discussion* of ideas, questions and problems from that day’s assigned reading. Where beneficial for exploring related topics or for addressing specific course objectives, class discussions will be supplemented by original source reading sessions, individual/group reports on background topics, brief lectures and student/instructor presentations of homework problems that expand on reading assignments. Each student will also deliver a presentation on their research project (see below). Sufficient notice will be provided for preparation of individual/group reports and presentations.

Attendance at and active participation in all class sessions is expected.

Most class discussions will be based on assigned readings taken either from the text or provided by me. To meet course expectations with respect to participation in discussions, you will need to set aside (and spend!) sufficient time to complete these assigned readings with care. Discussion Guides will be provided for most readings to help you prepare for class discussions; these will include several specific questions to guide your reading and to help you begin to focus on important aspects of the passages. Discussion Guides will sometimes be collected in class and should be kept in your Course Notebook (see below) upon completion/return. In addition to taking notes on these focus questions, you should take notes on anything you find interesting, useful or perplexing about the reading. *Always* follow mathematical arguments with pencil and paper, and reflect upon the degree to which these arguments seem to be *mathematically and historically* accurate, illustrative or important. I recommend making lists of questions you have to share during class discussions or office hours; you might also use other sources (including the web) to look for information related to your questions or as background for the reading. Reading quizzes (on which reading notes may be used) may sometimes be given in class.

Completion of assigned readings and Discussion Guides before class is expected.

Taking notes during class discussions is highly recommended (but not required). Notes taken during discussions can be included in your Course Notebook (which in turn may be used during the Final Exam). Keep in mind that taking notes during a discussion is different than taking notes during a lecture. For one, there may not be anyone putting notes on the board that can just be copied down. You’ll also need to pay careful attention to the comments of fellow students, not only to stay involved in the discussion, but also because these contributions may be more meaningful, helpful or interesting than anything I have to say!

Thoughtful contributions to and meaningful questions about discussion topics are expected.

Reviewing your reading and class notes following class discussion is also highly recommended. Try to synthesize the best of all contributions in order to solidify your own understanding and to identify any new questions you might have. You might also wish to re-read portions of the assigned material, especially before completing homework sets. Any notes you take as part of this post-discussion review may be included in your Course Notebook (which in turn may be used during the Final Exam).

To promote effective discussions and class participation, the following guidelines will also be adopted for the course:

All participants in Math 463 are expected to:

- 1. arrive in the classroom sufficiently early to be prepared for class to begin exactly at 12:00;**
- 2. prepare for class discussions or activities in advance;**
- 3. contribute relevant and meaningful ideas, questions and suggestions for discussion;**
- 4. listen actively and attentively to the contributions of others;**
- 5. invite and encourage everyone to participate in discussions and class activities;**
- 6. allow others to respond to an idea before presenting a new idea;**
- 7. remain aware of the time allotted for the discussion/activity;**
- 8. remain aware of and focused on the topic/question/activity assigned for discussion.**
- 9. demonstrate respect for others, their experiences and their ideas;**
- 10. refrain from behavior that interferes with the learning of others;**
- 11. assume responsibility for their personal understanding by synthesizing ideas from readings and class discussions and by resolving any remaining questions about these ideas through appropriate follow-up (e.g., office hours, consultation of other sources, future discussions).**

Should they arise, concerns about the level of class attendance, participation or preparedness will be discussed privately with the individual(s) involved outside of class; Participation and Citizenship scores may be adversely affected should difficulties continue. Unexcused absences and habitual late arrivals (or early departures) will

automatically result in a lower Participation and Citizenship score; in extreme cases the final course grade may be further lowered by one letter grade.

Course Notebook

This assignment has been designed to (1) encourage you to complete assigned readings in a timely fashion; (2) help you to focus your readings of assigned material in preparation for class discussions; and (3) provide you with a mechanism for collecting and organizing your reflections on course content in preparation for the final exam. Ideally, it will be suitably organized to be of value to you in your future teaching, or simply in finding historical references easily. Minimally, it should be suitably organized for your use during class discussions, quizzes and the final exam.

Your final course notebook will include any notes you make in response to the following materials:

Course Questions List consisting of the (essay) questions that define our specific knowledge objectives for the course. These questions will form the backbone of our final (and only) exam. Minimally, you need to include the list of questions in your notebook, even if you prepare no notes in advance of the final. However, it may be more useful to take, review and revise notes on these questions on a regular basis as we proceed throughout the semester.

Discussion Guides consisting of specific focus questions for about each assigned reading. These questions should not be viewed as a complete list of what could – or should – be gleaned from the reading, but are instead intended to provide a framework for our in-class discussions of the readings. Accordingly, I highly recommend that you read through all the questions on each discussion guide BEFORE you begin the assigned reading.

Other You may also include supplementary material that you feel meets the purposes of the Course Notebook, provided that these are organized in some suitable, meaningful way. For example, you may wish to include your notes from class discussions, lectures, reports and presentations; your draft and completed course projects; handouts distributed in class; and/or your completed homework sets.

Although I am open to any reasonable method of organizing all these materials, I highly recommend that a good quality 3 – ring notebook that would allow you to add or rearrange materials along the way. (I also tend to give LOTS of handouts , which you may want to include in your Course Notebook, so get a thick one!) *Your name, the course number and the semester should be clearly marked on the outside of your notebook in some way.*

Please note that a Satisfactory Course Notebook is a requirement for a passing grade!

I will provide one or more interim checks of your Course Notebook during the semester (in addition to collecting notes on individual Discussion Guides from time to time). Further guidance in preparing a satisfactory course notebook will be provided as needed at that time.

IMPORTANT!!! IMPORTANT!!! IMPORTANT!!!

The writing you do for the Course Notebook should be “prior to first draft” writing!

I will not pay attention to spelling, punctuation, grammar, sentence construction or other technical writing features when I review your notes. In fact, I do not even expect full sentences or paragraphs (but you may use them, if you wish). Rather, I encourage you to use a format and style that will be useful in terms of making meaningful contributions to class discussions and for your personal use on quizzes, exams and in your future teaching/studies. You might give some thought early on to the question of what format and style will be most useful for these purposes, but feel free to make changes in this as time goes on.

Automathography (via e-mail)

The purposes of this assignment are (1) to make sure I have your e-mail address; (2) for you to (re-)introduce yourself to me; and (3) to give me some idea of your writing style. In your automathography, tell me about the (math and history) courses you have taken, what your favorites were, which you found hardest. Explain what your (mathematical and historical) interests are, what you plan to do after graduation. Reveal why you signed up for this course and what you expect to get out of it. If you have any anxieties about this course, or any special needs, let me know. You are encouraged to be creative in your response, and may include additional information beyond the questions asked above. Submit via **e-mail** to to janet.barnett@colostate-pueblo.edu no later than **midnight on Monday, 3 September**. Late fees will apply to anything mailed after that time!

Homework Sets

Homework sets will be assigned and collected on a regular basis, especially during the portion of the semester focused on pre-18th century developments. In a typical homework set, you will be assigned a selection of mathematical problems from the chapter in question; usually, you will have some choice as to which of these you solve. These problems will sometimes require you to work in the style of the culture and time period under discussion. Doing so is one of the more interesting aspects of mathematics history! Such exercises not only deepen your own mathematical understanding, but also provide important insights into the process of assessing and evaluating the mathematical understanding of other individuals. When submitting homework sets, please start each problem on a new sheet of paper (to facilitate grading and possible revision submissions) and write on one side of the paper only with sufficient margins for comments. Clear and organized work is – of course – expected.

In addition to mathematical problems drawn from our text, homework sets will usually include a short reflection or analysis essays. These essays need not be word-processed (although that would be nice), but should be organized and presented in complete sentences and paragraphs. Some of these will ask you to respond to an original source excerpt, but no additional reading or research beyond what appears in our textbook will be necessary to complete these. It will be helpful to think of your audience as another student in the class to whom you are trying to explain your perspective on the question.

Some homework sets may ask you to complete an article review or more formal “essay” as a means of providing you with practice in these activities and feedback on your progress with them prior to the Final Exam. Technical requirements for these will be distributed with the assignment.

All homework problems and essays will be carefully read, commented upon and scored. You may be asked to revise insufficiently detailed work. Late homework is subject to deductions. You are encouraged to discuss homework problems and essays with each other and with me; the write-up must be your own, however. Some homework sets will also include optional challenge questions which are eligible for extra homework credit.

Course Projects

Each of you will complete a written paper on an Important Mathematical Person (IMP) and his/her mathematical contributions. A 20-minute presentation of your research will also be delivered (by you!) when we return from Thanksgiving Break. Details and due dates are described in an attachment to this course outline

PRESENTATION PROPOSAL

Rather than spread our presentations out over 4 or 5 class days, I would prefer to arrange one (or two) longer time periods that we could devote just to presentations. For example, we could meet for 5 – 6 hours on a Saturday (with lunch provided by me as a mid-day break) and hold a “mini history conference”. You could even invite your friends, other professors or family members! Alternatively, we could spend two longer sessions (on Tuesdays and/or Thursdays), although scheduling this around our class schedules might be difficult.

Should we be able to make such an arrangement, an equivalent amount of class time would (of course) be cancelled; these days to be distributed throughout the semester with dates announced in advance.

A survey will be distributed early in the semester to order to get your feedback concerning this proposal.

A SPECIAL OPPORTUNITY: I strongly encourage you to start thinking now about submitting one of your projects (probably the one that you present in class) for presentation at the fifth annual *Pikes Peak Regional Conference of Undergraduate Research in Mathematics*, to be held in February 2008. Further details concerning this conference, including location, will be provided in class.

Final Exam

The final will consist of two parts: a take – home portion distributed no later than Wednesday, December 5th and an in-class during our regularly scheduled final exam period (Wednesday, December 12th , 10:30 am – 1 pm). This will be our only exam. Most questions on the take-home portion and some questions on the in-class portion will be drawn (directly) from the Course Questions List. Other take-home questions may include an analysis of a (short) original source reading or a review of an article (to be distributed with the take-home portion of the

final). A study guide for the in-class portion will be distributed in class no later than Thanksgiving break. **You will be allowed to use your Course Notebook (see above) during the in-class portion of the Final Exam.**

Course Grades

To qualify for a passing grade (D or better), the following requirements must be met:

- a satisfactory Course Notebook (see above)
- a minimum final homework score of 65%
- a minimum score of 50% on each Course Project and on the Final Exam

The remaining course requirements will be weighted according to the following system:

200	Homework Sets	
200	IMP Course Project & Presentation	(includes peer evaluations of other presentations)
50	Participation and Citizenship	(includes automathography, group/individual reports and quizzes)
<u>150</u>	Final Exam	
600		

Additional requirements for grades of A, B, C are as follows; fractionated grading will not be employed.

- C : At least 400 points out of the total 600 above and a final homework score of 70% or higher
B : At least 470 points out of the total 600 above and a final homework score of 80% or higher
A : At least 530 points out of the total 600 above and a final homework score of 90% or higher

NOTE: Opportunities for revision and some extra credit will be available during the semester.

Attendance

To contribute to class discussion and to benefit from it, you must be present in class. Unexcused absences will automatically result in a lower Participation and Citizenship score; in extreme cases the final course grade may be further lowered by one letter grade. Missing part of a class meeting will constitute an absence; concerns about attendance will also be discussed privately with the individual(s) concerned. Illness, family crisis, and approved participation in activities for other courses, programs or in intercollegiate athletic events are valid excuses for absence. (For example, attending the CCTM conference in Denver on October 4-5 would count as an excused absence.) If you must miss class and can inform me in advance, please do. If you can't inform me in advance, please contact me outside of class prior to our next class session. Make-up activities may be required for excused absence.

Academic Integrity

Violations of academic integrity (e.g., cheating, plagiarism) will result in measures deemed appropriate by the course instructor, up to and including a final grade of "F" in the course for all parties involved. Please reference all ideas and information you receive from others, from printed materials, and from sources such as the Internet; failure to do so will minimally result in a grade of "0" on the assignment, with no revision opportunity. All academic integrity violations will be reported to the Dean of Student Life; violations by prospective teachers will also be reported to the Teacher Education Program and. If you are not sure what constitutes "cheating", please ask!

Withdrawals

The last day to drop with no transcript record of the course is Monday, September 10.
The last day to drop with a grade of "W" is Friday, October 26.

Anyone unable to complete the course due to documented circumstances beyond their control which arise after the final withdrawal date may request a course grade of Incomplete; no other withdrawal arrangements will be considered after the final withdrawal date. An incomplete must be completed within a year.

If you decide to withdraw from the course, the paper work is your responsibility.
I strongly urge you to talk with me about the course before making this decision.

Office Visits & Study Groups

My office hours are for your use; please use them. I will arrange them to meet the needs of as many people as possible. If they do not meet yours, an appointment can be made. I also encourage you to form regular study groups with other members of the class in order to discuss current course material and assignments. I am willing to serve as a resource upon request at other times if I am available. The Math Learning Center should not be used as a meeting place, but I can help you in reserving some other classroom for your use.

The University abides by The Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, which stipulates that no student shall be denied the benefits of education "solely by reason of a handicap". If you have a documented disability that may impact your performance in this class and for which you

may require accommodations, please see the instructor as soon as possible to arrange accommodations. In order to receive accommodations, you must be registered with and provide documentation of your disability to the Disability Serviced Office, which is located in the Psychology Building, Room 232.

HISTORY OF MATHEMATICS
Summary of Project & Final Exam Dates

Monday	Tuesday	Wednesday	Thursday	Friday
Aug. 27	28	29	30	31 <i>List of top 3 IMP choices (part of HW#1)</i>
Sept. 3 Automathogrpahy <i>(via e-mail)</i>	4	Sept. 5 LIBRARY RESEARCH TRAINING – PHYSICS/MATH COMPUTER LAB	6	7
10	11	Sept. 12 <i>IMP Part A</i>	13	14
17 <i>(IMP Part A returned)</i>	18	19	20	21
24	25	26	27	28
Oct. 1	2	3	Oct. 4 CCTM	Oct. 5 CCTM
8	9	Oct. 10 <i>IMP Part B</i>	11	12
15	16	17	18	19 <i>(IMP Part B returned)</i>
22	23	24	25	26
29	30	31	Nov. 1	2
5	6	Nov. 7 <i>IMP Part C</i>	8	9
12	13	14	15	Nov. 16 <i>Study Guide for In-Class Final Distributed (IMP Part C returned)</i>
19	20	21	22	23
Nov. 26 <i>Earliest possible date for first IMP Presentations</i>	27	28	29	30
Dec. 3	4	Nov. 5 <i>Take Home Qstns for Final Exam Distributed</i>	6	7 <i>Final possible date for last IMP Presentations</i>
10	11	Nov. 12 <i>Final Exam 1:00 - 3:20 IMP Revisions (B & C)</i>	13	14

