MATH 163 **HISTORY OF MATHEMATICS** January 4, 2010

INSTRUCTOR: Carl FitzGerald Phone (858)-534-2454 cfitzgerald@ucsd.edu
Office: 5816 AP&M Office Hours after lecture near Hall and M&W 1:30 – 2:50 PM

TEACHING ASSISTANT:

TEXT: The History of Mathematics: an Introduction 6th Edition by David M. Burton, McGraw-Hill 2007.

GRADING: Homework 16% Presentation 2%

First Hour Examination 16% Second Hour Examination 16%

Term Paper 16% Final Examination 34%

HOMEWORK: Homework is due in section or in the course mailbox on the 6th floor of AP&M before section meetings. No late homework will be accepted, except for medical or other reasons beyond the student's control. Students may work with others, but each student should understand what is being submitted.

EXAMINATONS: Each examination is closed book and closed notes. No calculators or other electronics devices are allowed.

There will be corny matching questions. For example, some lists will be given of mathematicians and of dates births and deaths, and of contributions to mathematics, and of geographical locations. The problem may be to indicate for each mathematician the appropriate dates, contributions and locations.

There will be problems to be done in the style of different cultures. For example, there may be a calculation to be carried out in the Egyptian or the Babylonian fashion.

There will be questions related to historical mathematics. For example, a problem may ask that it be proved that Archimedes's construction trisects a general angle and to explain why it is not a solution to the classic problem of trisecting an angle.

The midterm examinations will be in the lecture hour and room, WLH 2111. The First Midterm is scheduled to be on Friday, January 29; the Second Midterm is scheduled to be on Friday, February 26. The Final Examination is Wednesday, March 17, from 8:00 AM to 10:59 AM in a room to be announced.

TERM PAPER: The paper is due in class on Monday, March 8; for each school day late, 2% will be deducted from its grade. The paper may not be handed in after the Final Examination. --- Each term paper will be graded on neatness, style, content and documentation.

Please keep a copy of the paper!

Papers are not normally returned. If you need the paper returned, mention that before handing the paper in and indicate on the paper that you need it returned and the agreed upon details.

The paper should be 8 to 12 typed pages, that is, at least 1500 words and not more than 3000 words. (If it is not typed, it must be very neat and easy to read.) Diagrams and pictures may make it more interesting. The papers should be written in a formal style. Good grammar should be used. There should be no slang expressions. There should be no contractions. The pronoun "I" should not appear. Individuals should not be referred to by their first name. (John von Neumann is not "Johnny.") There should be no emoticons. 

The paper should have to do with the history of mathematics, but it does not have to be of the time period or cultures discussed in class. In fact, it would be appreciated if the paper and presentation involves one of the following: (1) recent developments in mathematics, (2) other cultures, (3) modern women mathematicians. Check with the instructor if there is any doubt about the acceptability of a topic.

In regards to documentation, a total of at least five references must be used and cited. At least one of the references must be a good primary or near primary source, perhaps in translation.

The following is a list of near primary works easily available:

Egyptian: The Rhind Mathematical Papyrus by Chace.

Greek: Euclid: The Elements by Heath.

The Medieval Latin Translation of the Data of Euclid by Ito.

Archimedes: The Works of Archimedes by Heath.

Apollonius: On Conic Sections Books I-III by Taliaferna

Nicomachus: Introduction to Arithmetic (The Great Book Series)

Islamic: al-Khowarizmi: Hisab al-jabr w' al muqabalah by Rosen.

Omar Khayyam: The Algebra of Omar Khayam by Daoud Kasir.

Chinese: Fleeting Footsteps: Tracing the Conception of Arithmetic and algebra in Ancient China by Lay-Yong Lam and Tian-Se Ang.

Europe: Jerome Cardan: The Book of Chance

Girolams Saccheri: Euclid Vindicatus

Descartes: Geometry (The Great Book Series)

For many other items: A Source Book in Mathematics: 1200-1800 by Dirk Struik,

A Source Book in Mathematics by D. E. Smith

The Treasury of Mathematics by H. O. Midonick

The History of Mathematics: A Reader by John Fawvel and Jeremy Gray

For an overview of an individual, consult a general history text and The Dictionary of Scientific Biography and various web sites particularly

http://www-groups.dcs.st-and.ac.uk/~history/

It is not necessary to write about an individual. Some possible topics: the cycloid, game theory, fractional dimensions, Mercator projection, fractals.

Remember to have history and mathematics in the paper.

PRESENTATONS: Unless more time has been previously granted, the time limit is 12 minutes. In signing up to give a presentation, the speaker gives assurance that the talk has been given and timed to less than 12 minutes. The talk does not have to be on the same subject as the term paper.

Talks can be scheduled starting January 20 at the lecture time. To sign up, a student must specify a topic and the topic must be substantially different from those of students who have already signed up. A student can only sign up for the next available date.

HOMEWORK

Homework I Mathematics 163 Due in section Thursday, January 7, 2010

Read from Burton sections 1.1 and 1.2 pages 1 through 20 and sections 2.1 through 2.3 pages 33 through 53.

Hand in the solutions to the following problems:

1. Page 18 #1abcdef
2. Page 18 #2abcd
3. Page 18 #3abcd
4. Page 18 #4
5. Page 51 #1abc
6. Page 51 #2abc
7. Page 52 #3a

Homework II Due in section January 14, 2010

Read section 2.4 pages 53 through 61. Read through the Egyptian problems not assigned.

1. Page 52 #4a

2. Page 52 #6ab

3. Page 53 #19 Solve the first part by using a guess of one half a loaf for each man as the first approximation.

4. Page 53 #20 Solve the first part by using a guess of two for the quantity as the first approximation.

5. Page 53 #24

6. Page 61 #1a

7. Page 62 #9ab

8. Page 62 #10ab

Read about the Babylonian number system in section 1.3; pages 20 through 27.

9. Page 29 #1abcde

10. Page 29 #2ab

Homework III Due in section on Thursday, January 21, 2010

Read about the Babylonian mathematics page 63 through page 83

1. Page 29 #3

2. Page 29 #4abcd (Your should understand page 29 #5.)

3. Page 62 #5 (The Moscow Papyrus is Egyptian mathematics. See the top of page 57 for the formula.)

4. Page 72 #1ab

5. Page 72 #2

6. Page 72 #4

7. Page 72 #6ac

8. Page 73 #12

9. Page 73 #13ade (You should be able to do the others.)

10. Page 81 #1

11. Page 81 #2

Homework IV Due in section on Thursday, January 28, 2010

Read about one of the Greek numbering systems on page 16 through 18 and read page 85 through page 107.

1. Page 81 #5
2. Page 82 #7 Use a calculator to find the correct value of the square roots to five or six decimal places; compare these values with the decimal approximations to the rational estimates found in the problem.
3. In lecture we found that all reduced (or primitive) Pythagorean triples can be generated by considering appropriate pairs of positive integers P and Q. For an appropriate pair, we let the even leg be $2PQ$ and the other leg be $b = P^2 - Q^2$ and the hypotenuse be $c = P^2 + Q^2$. For each of the following pairs, either find the corresponding primitive Pythagorean triple or indicate why the pair is not appropriate.

   (a) $P = 7, Q = 4$ (b) $P = 7, Q = 5$ (c) $P = 8, Q = 3$
4. Page 19 #5abcde
5. Page 19 #6abc
6. Page 19 #7abcd
7. Page 105 #1
8. Page 105 #3
9. Page 105 #8

THE FIRST MIDTERM EXAMINATION

IS IN LECTURE ON FRIDAY, JANUARY 29, 2010.

THE TEST COVERS MATERIAL THROUGH HOMEWORK IV.