Homework for Math 3010 §1, Fall 2025

A. Treibergs, Instructor

January 22, 2026

Our text is by David Burton, *History of Mathematics: An Introduction 7th ed.*, McGraw Hill 2010, ISBN-10: 0073383155, ISBN-13: 978-0073383156. It is available via Inclusive Access (Bookshelf tab in Canvas). Please read the relevant sections in the text as well as any cited reference. Assignments are due the following Friday, or on April 19, whichever comes first.

Your written work reflects your professionalism. Homework is to be written legibly on paper. Do not crowd your work nor write too small for me to read. Please copy or paraphrase each question. Make sure your solutions are complete, self contained and written in good technical English. This means that you should write in complete sentences, provide adequate explanation to help the reader understand the structure of your argument, be thorough in the details, state any theorem that you use and proofread your answer. Theorems from the text and notes should be stated, and not merely cited by number. Any sources you use other than the text and notes (such as looking up the answer on line) should be cited.

Homework from Wednesday to Monday will be due Friday. Late homework that is up to one week late will receive half credit. Homework that is more than one week late will receive no credit at all. Homework that is placed in my mailbox in JWB 228 before 4:00 pm Friday afternoon will be considered to be on time. All homework must be handed in by Apr. 27.

> Please hand in on paper problems A on Friday, Jan. 9.

A. Exercises from Burton's *The History of Mathematics.*

```
1.2     18[3]
2.3     51[1, 2, 7, 13]
```

> Please hand in problems B1 – B3 on Friday, Jan. 16.

B1. Exercises from Burton's *The History of Mathematics.*

```
1.3     28[2, 3, 4]
2.4     61[1, 2]
2.5     71[3]
```

B2. Compute the sum using Babylonian arithmetic. Convert the summands and your answer to decimals and check that your addition is correct.

$$(5, 51, 12, 49) + (13, 45, 19) =?$$

B3. From Bunt *et. al.* 63[8].

Solve the following problem that occurs on a Babylonian tablet. Given that the circumference of a circle is 60 and the length of the saggita $\overline{AB}$ is 2, calculate the length of the chord $\overline{CD}$ in the figure.
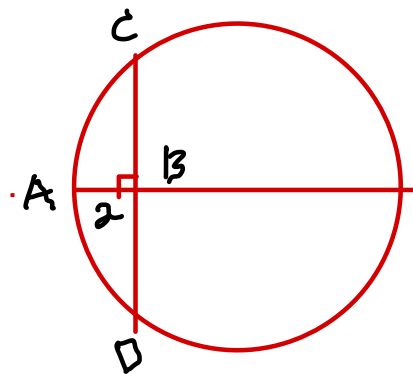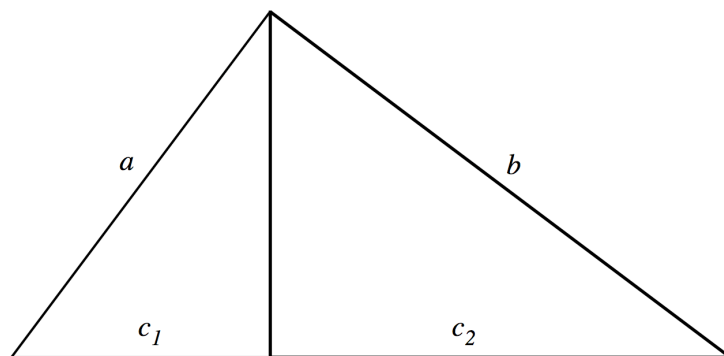

Please hand in problems C1–C3 on Friday, Jan. 23.

C1. Exercises from Burton's *The History of Mathematics*.

```
1.2     19[7]
3.2     103[2, 11b, 14]
```

C2. In Book VI of *Elements*, Euclid gives the following argument for the Pythagorean Theorem based on similar triangles. Show that the three triangles in the figure are similar, and hence prove the Pythagorean theorem by equating ratios of corresponding sides. [Stillwell *Mathematics and its History.* p. 10]

**C3.** Show that the Golden ratio ϕ is irrational.

2

D1. Exercises from Burton's *The History of Mathematics.*

$$
\begin{array}{ll}
3.3 & 117\,[5] \\
3.4 & 128\,[2,\ 4]
\end{array}
$$

**D2.** Find the area of the given lune.

2. Hippocrates of Chios (ca. 440 B.C.) performed the following quadrature of a lune. Consider a half of a regular hexagon $ABCD$ inscribed in a semicircle with diameter AD. Construct a lune between the semicircle with diameter AD and a semicircle with diameter AB exterior to the semicircle with diameter AD.
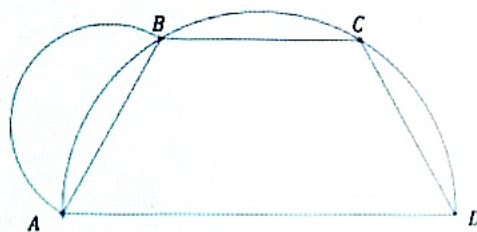
Show

Area of Trapezoid ABCD = 3(area of lune) + area of semicircle with diameter AB

D3. Check Euclid's construction of the regular pentagon. Suppose that collinear points A, B, C have distances $a = AB$, $\phi a = AC$. Construct the isosceles triangle $\triangle(BDC)$ with $a = BD = CD$. Let M be the bisector between B and C. Let the angle $\alpha = \angle(ACD)$.
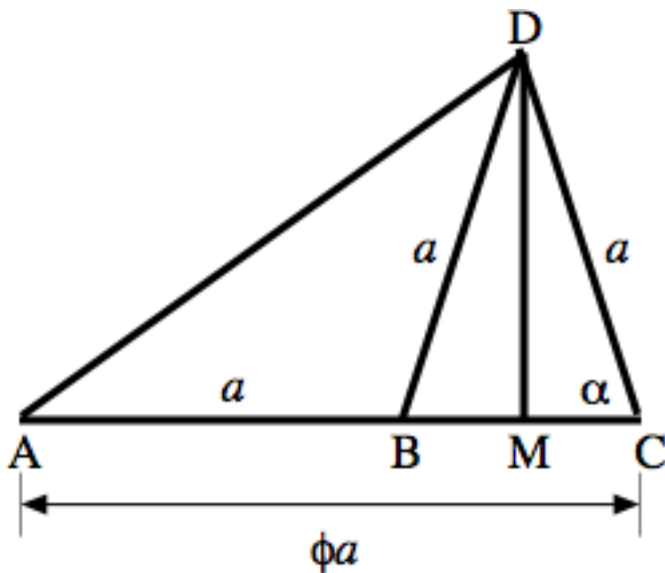
a. Find the length of DM using the triangle $\triangle(BMD)$

b. Show that $AD = AC$ using the triangle $\triangle(AMD)$.

c. Express the angles of triangle $\triangle(ABD)$ in terms of α and show that $\alpha = 72°$. Thus it is the central angle of a sector of a regular pentagon. HINT: The sum of the interior angles of any triangle is $180°$.

D4. On a separate piece of paper, write your Essay on Mathematics of Antiquity proposal. After the proposal is returned to you, please hand your proposal in again when you hand in your essay next week. Be sure to include in your proposal

- Working Title
- Short but specific description of what your essay is about. Don't just say you will discuss what the Greeks thought about π. Better say that you will describe how Archimedes showed that $3\frac{10}{71} < \pi < 3\frac{1}{7}$. Everyone in class should have a different topic.
- State an interesting fact you've discovered about your topic in your preliminary readings.
- State which style manual you'll follow. You can find a list at the Mariott website `http://campusguides.lib.utah.edu/style`
- Give two internet references. Please include the author and the URL.
- Give two book or journal references specific to your topic (other than Burton).

> Please hand in your essay E1 on Friday, Feb. 6.

E1. Essay on the Mathematics of Antiquity. Write an essay about a specific mathematical discovery/ theorem/ method that occurred before Christ.

- The paper should be five pages (in some reasonable font and font size) double-spaced and printed out on paper. It should be in written in good technical English. It should be written for an audience of Math 3010 students.
- There must be some mathematics, and mathematical explanation, in your paper. Just how you incorporate some mathematical exposition will vary from subject to subject. Include displayed equations and diagrams if appropriate.
- You must draw on a bare minimum of three book and journal sources. It is good if you include "primary" sources, quoting directly from the mathematician you're discussing, or at least from sources closest to them reconstructing the original source. A "Secondary" source is a scholarly interpretation later than the original subject of study in a book or journal. You may use blogs and Wiki articles provided that you give them credit. But also track down the author cited in a Wikipedia article.
- Give credit where it is due: whenever you use another author's ideas, whether appearing in your paper as direct quotation, paraphrase, or simply influence, you must cite them (with a footnote and then include in the bibliography). Formatting these citations and bibliography entries should be unambiguous, according to your chosen style guide. (Parts of these instructions are quoted from Patrikis's assignment 2-19-16.)
- Please attach your approved essay proposal from last week to your paper.