Homework for Math 3010 §1, Spring 2025

A. Treibergs, Instructor

January 16, 2025

Our text is by Victor J. Katz, *A History of Mathematics, 3rd. ed.*, Pearson India 2019. ISBN: 978-9353433000. Please read the relevant sections in the text as well as any cited references. 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. 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. 30.

Please hand in on paper problems A1 – A3 on Friday, January 10.

A1. Exercises from from Katz's *A History of Mathematics.*

```
28[2, 4, 10]
```

A2. 1. Use the ancient Egyptian procedure to find the area of a circle with diameter 12.

2. What would the area be if the modern value of π were used instead?

3. What percentage error made by the ancient Egyptians?

[Bunt *et. al.* 40[4]]

A3. The Egyptian calculation for the area of an arbitrary quadrilateral is to multiply half the sum of opposite sides by half the sum of the other two sides. Show that the Egyptian procedure for finding the area of a quadrilateral gives the correct result if the quadrilateral is a rectangle and gives too large a number if the figure is a nonrectangular parallelogram or a trapezoid. Is the procedure ever correct for a quadrilateral that is not a rectangle. (Can you prove it?) [Bunt *et. al.* 40[3].]

Please hand in problems B1 – B3 on Friday, Jan. 17.

B1. Exercises from from Katz's *A History of Mathematics.*

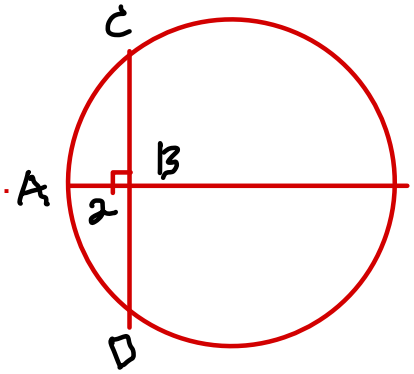
```
28[17, 18, 20, 21]
```

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.

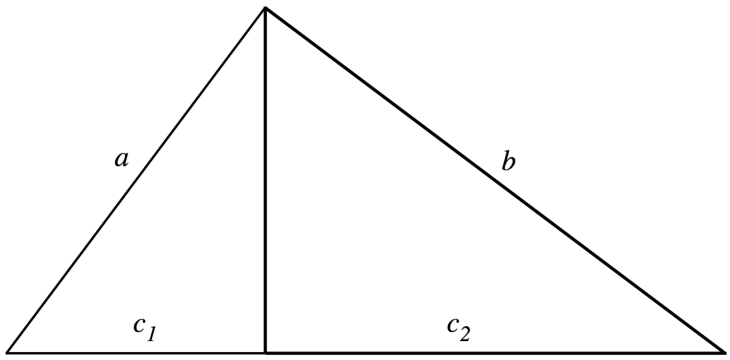


Please hand in problems C1–C3 on Friday, Jan. 24.

C1. Exercises from from Katz's *A History of Mathematics.*

```
47[7, 9, 10, 12, 21]
```

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.