

# MAT 515

# Midterm

October 28, 2020

Name: \_\_\_\_\_ ID: \_\_\_\_\_

|           |    |    |    |    |       |
|-----------|----|----|----|----|-------|
| Question: | 1  | 2  | 3  | 4  | Total |
| Points:   | 25 | 25 | 25 | 25 | 100   |
| Score:    |    |    |    |    |       |

There are 4 problems on 4 pages (plus this cover sheet) in this exam. Make sure that you have them all.

Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate what is where if you expect someone to look at it. **Books, calculators, extra papers, and discussions with friends are not permitted. No electronic devices may be used AT ALL.** If you brought a telepathic duck with you to the exam, feel free to use it to read my mind about the correct answers on the questions. Other extra-sensorially enhanced beings are not permitted however, and their use will constitute academic dishonesty.

Leave all answers in exact form (that is, do *not* approximate  $\pi$ , square roots, and so on.)

You have 80 minutes to complete this exam.

25 pts

1. Please write a complete and correct answer for each part below.

(a) Let  $A$ ,  $B$ , and  $C$  be points lying on line  $\ell$ . Give the definition of the statement  $B$  is between  $A$  and  $C$ .

(b) State the parallel postulate as used in this course.

(c) Let  $A$ ,  $B$ , and  $C$  be points in the plane. Define the angle  $\angle ABC$ .

(d) Let  $\mathcal{S}$  and  $\mathcal{S}'$  be sets of points in the plane. Define what  $\mathcal{S}$  is similar to  $\mathcal{S}'$  means.

(e) State the Fundamental Theorem of Similarity.

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**Id:** \_\_\_\_\_

25 pts

2. Prove that a parallelogram is a rectangle if and only if its diagonals are of equal length.

25 pts

3. Let  $P$  and  $Q$  be two distinct points in the plane, and let the dilations with  $\Delta_P$  have center  $P$  and scale factor  $r$ , and  $\Delta_Q$  have center  $Q$  and scale factor  $1/r$ , respectively. Show that  $\Delta_P \circ \Delta_Q$  is a translation.

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25 pts

4. Prove that the circumcenter of a right triangle lies on the hypotenuse.