

MAT 360 Topology

Problem Set 11
due Tuesday, Nov 22

- Problem 1.** (a) Show that a figure similar to a rectangle is a rectangle.
(b) Is it true that any two rectangles are similar? Give an “if and only if” condition for two rectangles to be similar, and prove your answer.

Problem 2. Prove the Pythagorean theorem by using similarity, as follows. Let ABC be a right triangle, AD its altitude dropped from the vertex of the right angle A to the hypotenuse BC .

- (a) Prove that the triangles ABC , ABD , and ADC are all similar.
(b) Conclude that

$$\frac{BD}{AB} = \frac{AB}{BC}, \quad \frac{DC}{AC} = \frac{AC}{BC}.$$

- (c) Manipulate these equalities using algebra, derive the Pythagorean theorem: $|AB|^2 + |AC|^2 = |BC|^2$.

Please also do problem 391 from the book. Use method of homothety, sections 181-182: first construct some other triangle with the same angles, where the perpendiculars satisfy the given proportion.