

MAT 360 Topology

Problem Set 10
due **Tuesday**, Apr 23

Problem 1. (a) Show that a figure similar to a circle is a circle. (Note that this is different from the question in the last homework.)

(b) Show that a figure similar to a rectangle is a rectangle. Is it true that any two rectangles are similar? 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 problems **391** and **395** from the book. Use method of homothety, sections 181-182. For 391, first construct some other triangle with the same angles, where the perpendiculars satisfy the given proportion. (Think about angles between those perpendiculars.)