

MATH 330 — Spring 2011

ASSIGNMENT 3

Due January 26, 2011

- 3.1. Discuss what you found most interesting in Chapter 1 of *Journey Through Genius* and explain why it was interesting to you. Be specific!

NOTE: Your answer will be *typed* and equivalent to: 1-2 pages long, double spaced, 12 point Georgia font.

- 3.2. As you are familiar with, in modern mathematics we often do not begin geometry courses with the Euclidean plane. We instead use the Cartesian plane, which we define as follows:

Assume all the axioms¹ for the real numbers, denoted \mathbb{R} . The Cartesian plane, denoted $\mathbb{R} \times \mathbb{R}$ or \mathbb{R}^2 , consists of all ordered pairs (x, y) where x and y are real numbers. We then define the distance between two points (x_1, y_1) and (x_2, y_2) to be

$$\text{dist}((x_1, y_1), (x_2, y_2)) := \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

We further define a triangle with corners at the points

$$(0, 0), (x_1, y_1), (x_2, y_2)$$

to be a *right triangle* if $x_1 x_2 + y_1 y_2 = 0$. Prove that the Pythagorean theorem holds for any right triangle in the Cartesian plane.

NOTE: This answer should be in essay form (i.e. use complete sentences and explain any computations you write down).

¹These may be found, among other places, at <http://www-history.mcs.st-and.ac.uk/~john/analysis/Lectures/L5.html>.