Mathematics 2260H – Euclidean Geometry

TRENT UNIVERSITY, Winter 2025

Assignment #1 A Cylindrical Geometry Due on Friday, 17 January.*

Consider the infinitely long hollow cylinder $C = \left\{ (x, y, z) \mid x^2 + z^2 = 1 \right\}$ in \mathbb{R}^3 .



Define a geometry \mathcal{C} as follows:

- The *points* of C are the points of the cylinder C.
- The *lines* of C are the sets of points that are the (non-empty) intersections of a plane of \mathbb{R}^3 with the cylinder C.
- Two lines of C intersect if they have at least one point in common and are considered to be parallel otherwise.
- The angle between two intersecting lines of C is the smallest angle between normal vectors to planes of \mathbb{R}^3 defining the lines.
- The distance between two points of C is the length of the shortest curve between the two points that is part of a line of C.
- 1. Which of Euclid's Postulates I–IV and Playfair's Postulate are true in C? Explain why in each case. [10]

Euclid alone has looked on Beauty bare. Let all who prate of Beauty hold their peace, And lay them prone upon the earth and cease To ponder on themselves, the while they stare At nothing, intricately drawn nowhere In shapes of shifting lineage; let geese Gabble and hiss, but heroes seek release From dusty bondage into luminous air. O blinding hour, O holy, terrible day, When first the shaft into his vision shone Of light anatomized! Euclid alone Has looked on Beauty bare. Fortunate they Who, though once only and then but far away, Have heard her massive sandal set on stone.

Edna St. Vincent Millay

^{*} Please submit your solutions, preferably as a single pdf, via Blackboard's Assignments module. If that fails, please submit them to the instructor on paper or via email to sbilaniuk@trentu.ca as soon as you can.