MA 314 Homework 11: Try a triangle!

1. Watching

- Watch the TED talk on crocheting hyperbolic planes. (It is 16 minutes 43 sec. long)

2. TED Talk Reflection

(1) What mathematical topics did the talk address and how are they related to what we've been discussing in class?

(2) In what ways did the speaker simplify the history or mathematics of hyperbolic geometry? Given the audience, were those simplifications useful or misleading or both?

3. Bricks

A path metric space (X,d) is **geodesic** if for any two points $a,b \in X$ there is a path γ from a to b whose length achieves $d(a,b)$. If X is such a space, a **triangle** in X consists of three points $a,b,c \in X$ and the geodesics (called the **edges** of T) joining a to b, b to c, and c to a. Let $\delta \geq 0$. A triangle T is δ-thin if, for each edge e of T, each point of e is distance at most δ from some point on the other two edges of T. The space X is δ-hyperbolic if every triangle is δ-thin.

(1) Prove that there is a number $\delta \in \mathbb{R}$, such that if T is a hyperbolic ideal triangle, then each point of the hyperbolic plane interior to T is (hyperbolic) distance at most δ from a point on one of the edges of T. (See me if you want a hint on this; we'll discuss this result in class)

(See here for a hint. If you use this hint please say so in your writeup – no points will be deducted.)