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MA 314 Homework 18: Putting a K in your Gauss-Bonnet.

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1. MORTAR

(1) Have a list of sources and an outline for your blog entry ready for Friday.

(2) Read the essay on the Hyperbolic Pythagorean Theorem (written by yours truly) on the course blog. You will have to log into the blog website in order to see it. Come prepared to discuss a list of 3 aspects you like and 3 ways it could be improved. (Also turn in written versions of your comments)

2. BRICKS

(1) Show that given $\alpha, \beta \in (0, \pi/2)$ such that $\alpha + \beta < \pi/2$, there exists a right triangle in $\mathbb{H}^2$ with angles α and β. (Hint: Take one side of the triangle to lie on the positive x-axis in the unit disc model. Take the other side to have angle α from the positive x-axis. Consider circles in $\mathbb{R}^2$ with center $(x_0, 0)$ and radius $r > 0$. Use the intermediate value theorem.)

(2) Use the previous result to show that in $\mathbb{H}^2$, for any $n \geq 5$, there exists a regular n-gon in $\mathbb{H}^2$ having each internal angle equal to $2\pi/n$.

(3) Show how to give the torus the structure of a hyperbolic cone surface.

(4) Do Problem 5.16 from Bonahon **and** explain its relevance for determining what kinds of geometric structures can be supported by a given surface.