- **Quiz 1** will be next week, February 19 and will cover the topics in Chapters 1 through 4 from the book which we have emphasized in class. You can use your books, notes, and any physical models you wish.

- For next week, read Chapter 5 and bring your model of the hyperbolic plane to class.

- Final draft of Assignment 2 (What is straight on the sphere?) is due next week.

Definition: Two geometric spaces, $\mathbb{G}$ and $\mathbb{H}$, are said to be **locally isometric** at points G in $\mathbb{G}$ and H in $\mathbb{H}$ if the local intrinsic experience at G is the same as the experience at H. That is, there are neighborhoods of G and H that are identical in terms of intrinsic geometric properties.

Fact: The plane is locally isometric to a cylinder. The plane is locally isometric to a cone at every point except the cone point.

Assignment 5 – first version due February 26

Problem 4.2. Global Properties of Geodesics on cylinders and cones.

a) How do we determine the different geodesics connecting two points? How many are there? How does it depend on the cone angle? Is there always at least one geodesic joining each pair of points? How can you justify your conjectures? (Hint: You will need to utilize covering spaces.)
b) How many times can a geodesic intersect itself? How are the self-intersections related to the cone angle? At what angle does the geodesic intersect itself?

For class discussion: Let's use what we know about geodesics on the plane, sphere, cylinder, and cones to examine some questions about parallel lines.

Euclid's Postulates

1. A unique straight line can be drawn from any point to any point
2. A finite straight line can be extended continuously in a straight line.
3. A circle may be described with any point as center and any distance as radius.
4. All right angles are equal to one another.
5. If a transversal falls on two lines in such a way that the interior angle on one side of the transversal are less than two right angles, then the lines meet on that side on which the angles are less than two right angles.

Playfair's axiom: Through a point not on a given line, exactly one line can be drawn in the plane parallel to the given line. (The word *parallel* as used here means not intersecting or having no Euclidean point in common.)

1. Does Euclid's 5^{th} postulate hold for these spaces?
2. Does Playfair's Axiom hold for these spaces?