Note to the reader: I wrote this essay, dated 11/10/1987, for my 12th grade *English* class, strangely enough! Enjoy.

Non-Euclidian geometry

Euclidian geometry is a simplification. It makes one very straightforward assumption. It is this assumption that separates it from non-Euclidian geometries. The assumption, at first glance, seems trivially true. It says that there is only one line parallel to a given line through a given point. For example, suppose the given line is the 50-yard line on a football field. Then if you stand anywhere else on the field, there is exactly one line parallel to the 50-yard line passing through your feet. If you stand on the 20-yard line, then the 20-yard line is the only line through you that is parallel to the 50-yard line.

Euclidian geometry is fine in regular regions; in planes or 3-dimensional space, Euclidian geometry is valid. However, the earth is not flat - it is spherical in shape. Therefore, we cannot use Euclidian geometry. If we only take straight lines to be ones that coincide with lines of longitude or latitude, then the assumption does not hold true. There would be no parallel lines on a sphere. All lines would cross. Hence, when we are dealing with the earth, Euclidian geometry is not altogether accurate.

For example, in spherical geometry, the sum of angles in a triangle is not necessarily 180 degrees. The amount of difference is so slight that it would only be noticed in relatively large objects; the difference, nevertheless, is still there. If we assume the world is completely smooth, then we can perform some startling experiments. If a man drove 500 miles north, 500 miles east, 500 miles south, and then 500 miles west, he would not end up in the same place that he started. The difference would depend on where he started in relation to the north and south poles.

There is one other type of non-Euclidian geometry. It is much harder to visualize than spherical geometry, however. In it, given the football field analogy, there would be other 20-yard lines - lines that pass through you and are parallel to the 50-yard line, but are distinct from the other 20-yard lines.

The two geometries described above, usually referred to as Lobachevskian and Riemannian geometries, repectively, are more useful in some situations than is Euclidian geometry. Mathematicians had spent centuries trying to prove Euclid's assumption that through a given point not on a given line, there exists only one parallel line. They could not, however, because it is not necessarily true. The reason that Euclidian geometry is taught in schools, rather than the other two, is that it is a much easier concept. It makes more sense to the mind and is less complicated. That doesn't mean, however, that the other two geometries are any less valid.

To understand the concept of non-Euclidian geometry, you must break free of your pre-conceived ideas of plane geometry. Not all triangles are drawn on flat surfaces. Non-Euclidian geometries simply take into account a different space. Suppose your space was the outside of a balloon. Your triangles wouldn't be the same. Everything would change. Suppose your geometry was the surface of a building. That would be interesting. The famous French mathematician Henri Poincaré developed his own non-Euclidian geometrical universe. There are many ways in which to construct a non-Euclidian universe.

As I previously stated, frequently the differences between Euclidian and non-Euclidian geometries are so slight as to be almost imperceptible. Therefore, it is usually to one's advantage to simply use Euclidian geometry. What non-Euclidian geometries do is stray away from the concrete and move to the abstract. It requires more thought to do a non-Euclidian proof than it does to do a Euclidian one. It is much harder to visualize. Sometimes it is unnecessary to visualize; trying to do a non-Euclidian proof would lead one to a deeper understanding of how geometry works. Geometry is not a mathematics course; it is a logic course. Non-Euclidian geometries are a step toward pure logic.