

4.6

THE SHAPE OF REALITY?

How Straight Lines Can Bend in Non-Euclidean Geometries



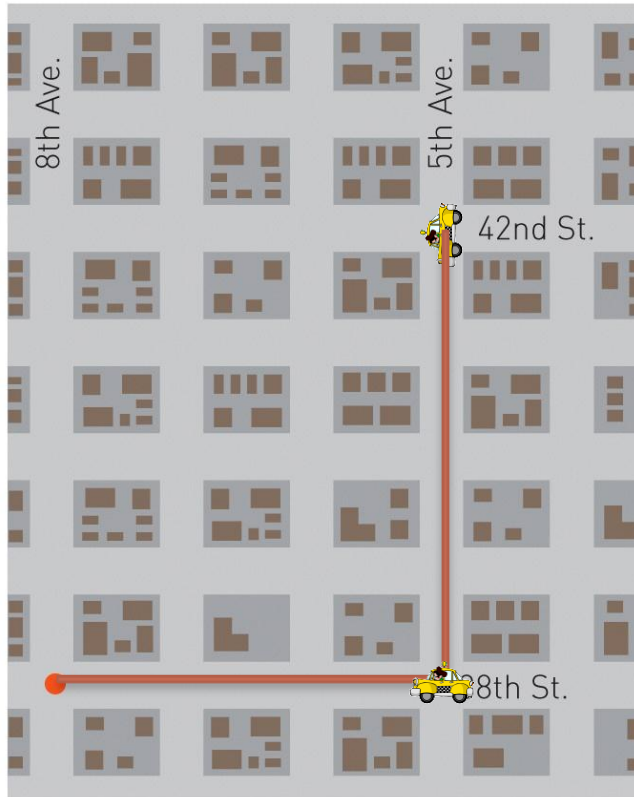
Public Domain from Wikipedia: http://en.wikipedia.org/wiki/File:Nasa_blue_marble.jpg

Does space curve?

QUESTION OF THE DAY:

Is the shortest distance always a straight line?

What is the shortest distance between two points?



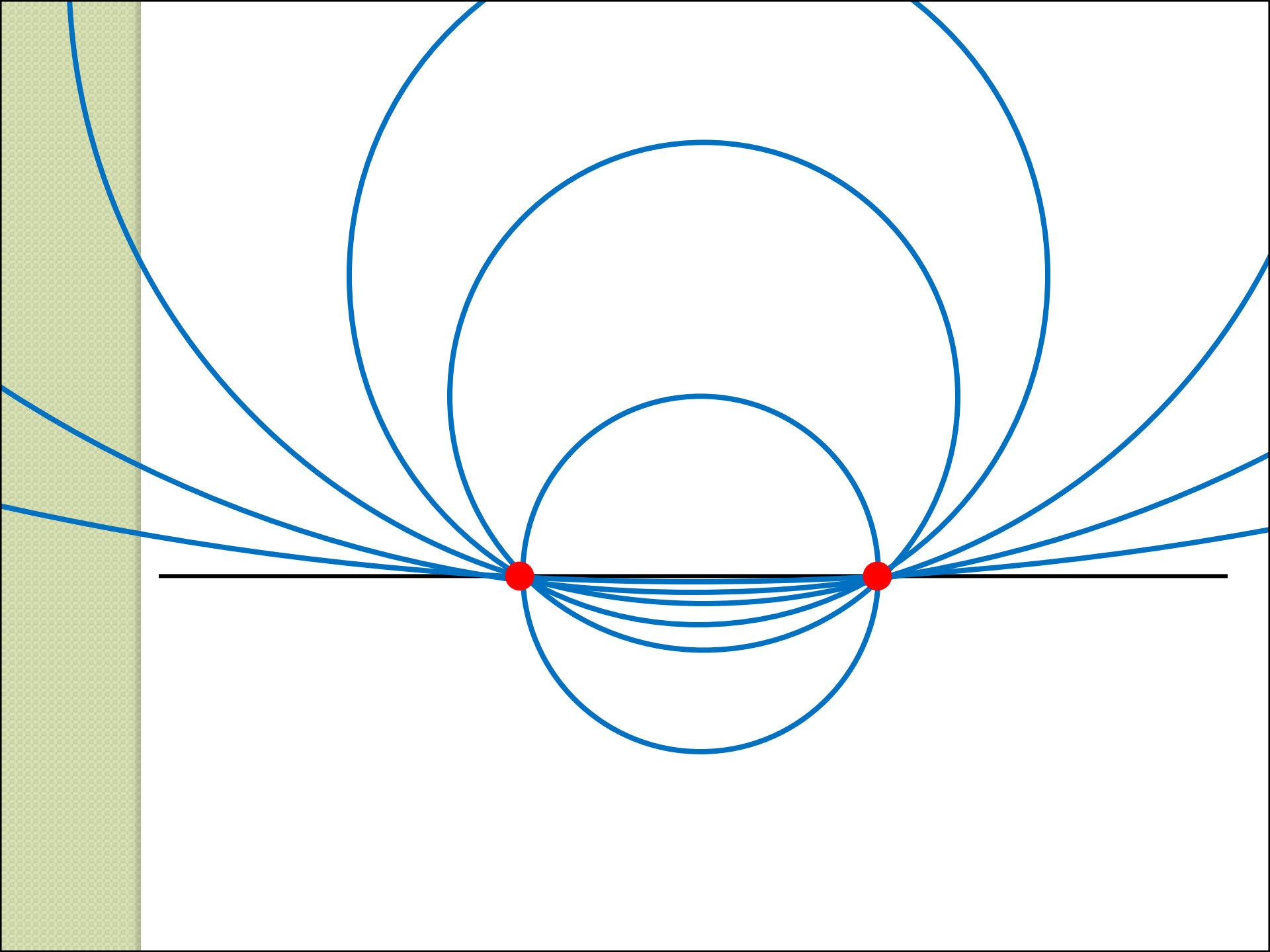
New York City

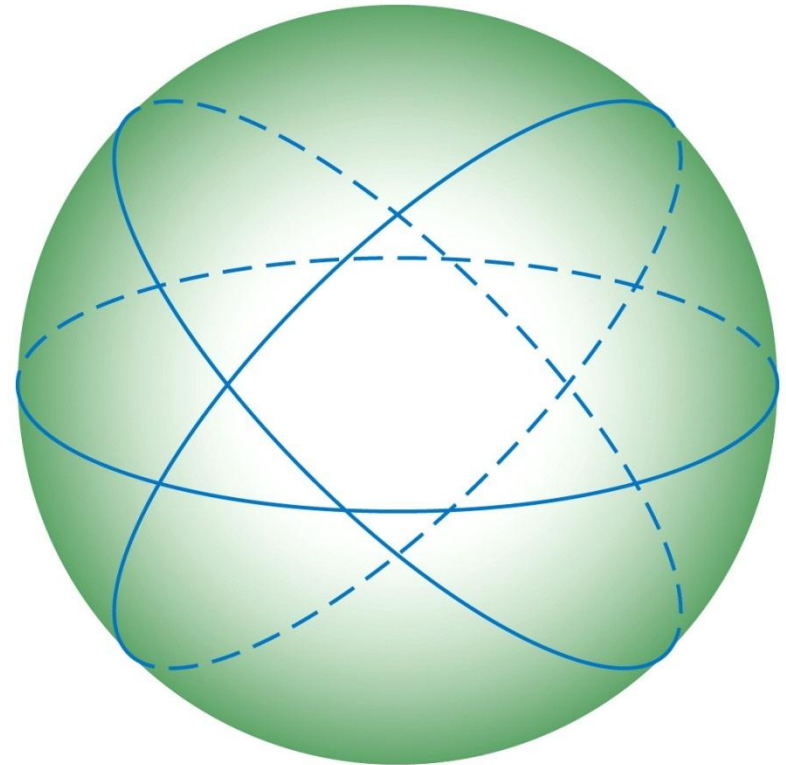
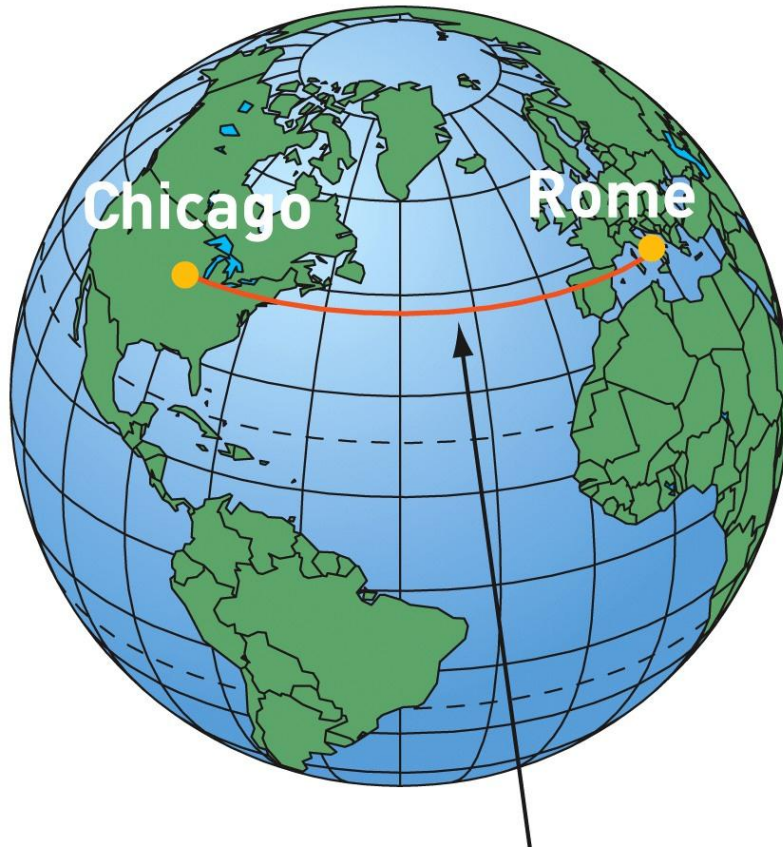


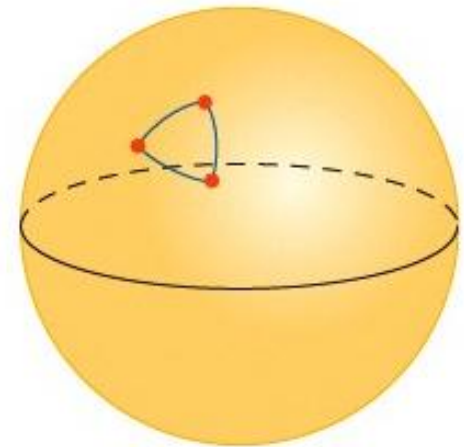
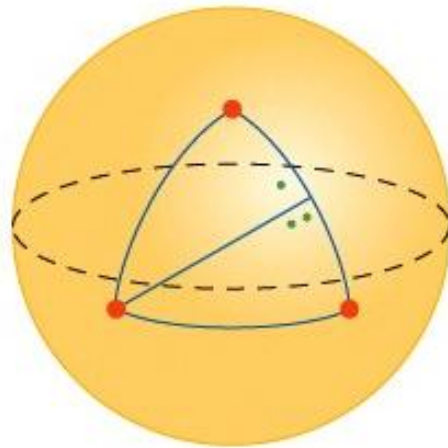
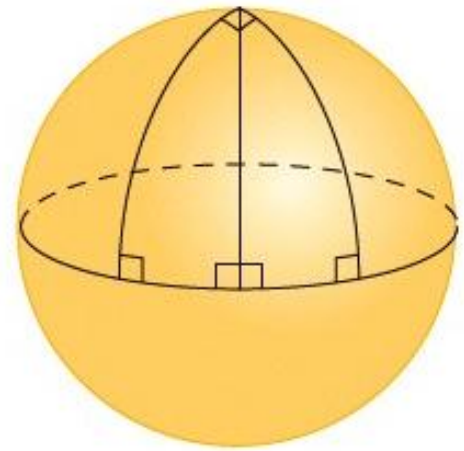
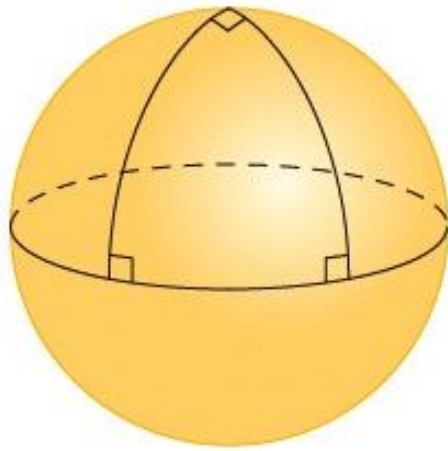
The World



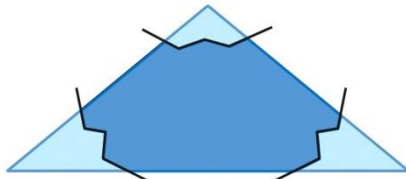
- Geodesic —







Extra Degrees Through Curvature

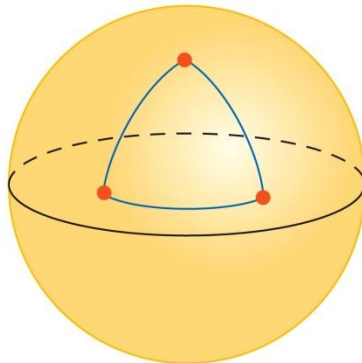


Cut off angles.



Sum is 180.

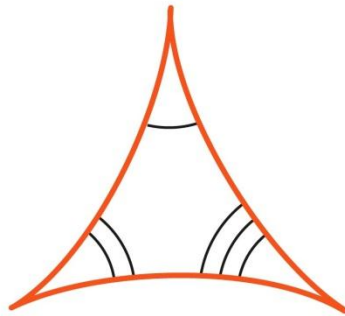
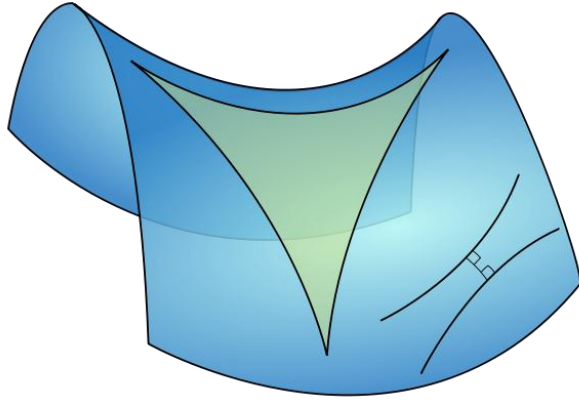
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Curvature of the sphere
causes "straight lines"
to bow out a bit.

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Geometry on a Saddle

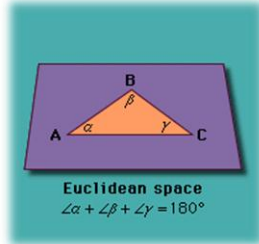


Sum of the angles
is less than 180° .

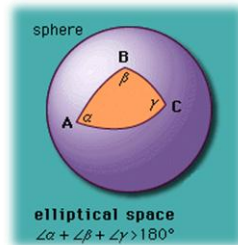


Different Types of Geometry –

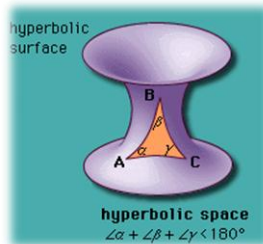
- Plane Geometry –



- Spherical Geometry –



- Hyperbolic Geometry –



Homework

- Read 4.6 The Shape of Reality pgs. 289-306.
- Mindscapes 4.6 # 2, 3, 5, 9-11, 19, 20, 26
- Bonus HW Question:
 - A wandering bear leaves home and walks 100 kilometers south. After a rest, she turns west and walks straight ahead for 100 kilometers. Then she turns again and walks north. To her surprise she finds that she arrives back home again. What color is the bear and how did you reach your conclusion?
- The Math Book Presentation

Resources

- <http://www.wiley.com/WileyCDA/>
- <http://www.pringles.com/home>
- http://en.wikipedia.org/wiki/File:Hyperbolic_triangle.svg
- <http://mathforum.org/mathimages/index.php/Image:TriangleGeometry.gif>