Spheres
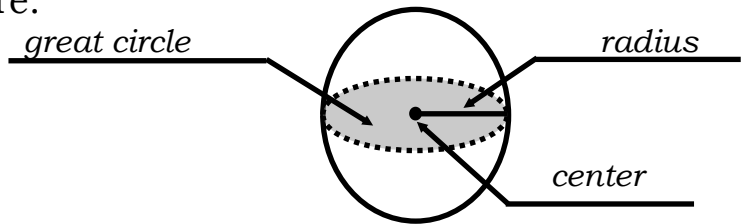
A **great circle** is a circle on the surface of a sphere with the same center and radius as the sphere.

great circle ————   ———— *radius*

$$SA = 4\pi r^2$$

$$V = \frac{4}{3}\pi r^3$$

center ————

Euclidean Geometry	**Non-Euclidean Geometry**	
Geometry on a plane	Geometry on a sphere (Spherical)	Geometry on a concave disk (Hyperbolic)
Line = straight line	Line = great circle on a sphere	
Parallel lines exist	Parallel "lines" do not exist	
Interior angles of triangles sum to 180°	Interior angles of spherical triangles sum to more than 180°	
Use in our everyday life	Use to travel the globe	
Two lines can intersect at exactly one point	Two "lines" can intersect at two points	

The area of spherical $\triangle ABC$ on a sphere with radius r is

$$A = \frac{\pi r^2}{180°}(m\angle A + m\angle B + m\angle C - 180°).$$

Solids of Revolution

The given regions will rotate around the x-axis or y-axis.
If the region is not touching the axis of rotation, there will be a hole in the 3-dimensional figure created by rotating the region.

Rectangular region $\xrightarrow{\text{rotate}}$ Cylinder

Triangular region $\xrightarrow{\text{rotate}}$ Cone

Semi-circular region $\xrightarrow{\text{rotate}}$ Sphere