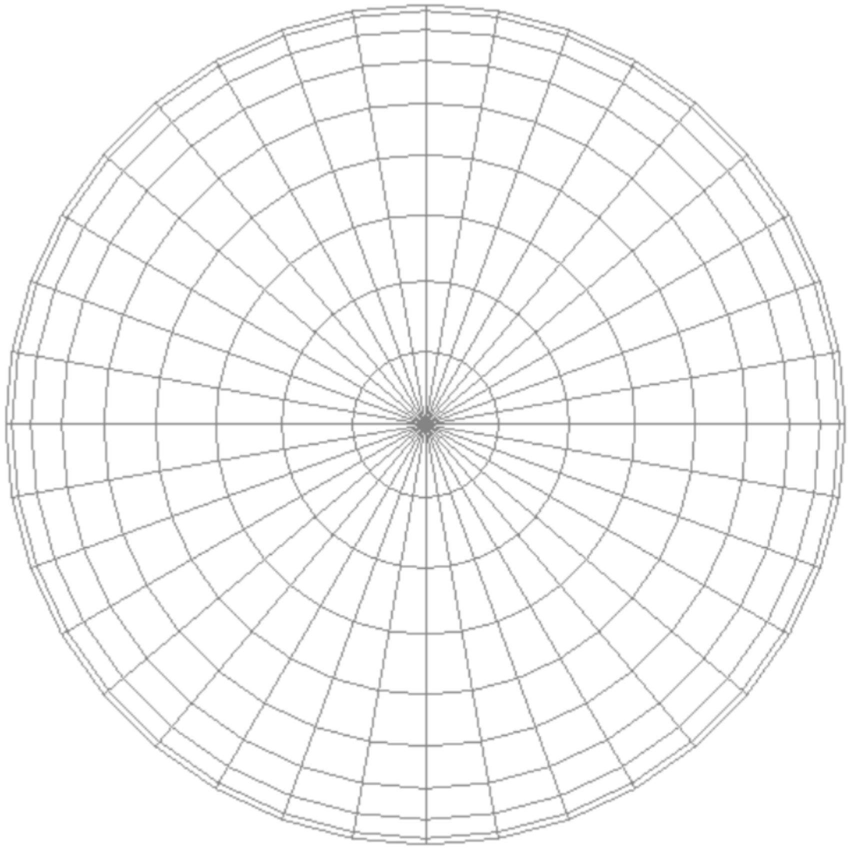
Sphere in Parametric Form

- Lets say we want a perfect sphere or as close as we can get to it
- We will use GL_QUADS to make the calculations a little easier for us

  - We will use two parameters:
  - • latitude (φ)
  - • longitude (θ)



Rendering a Sphere

- At a given φ, the sphere is just a circle of radius

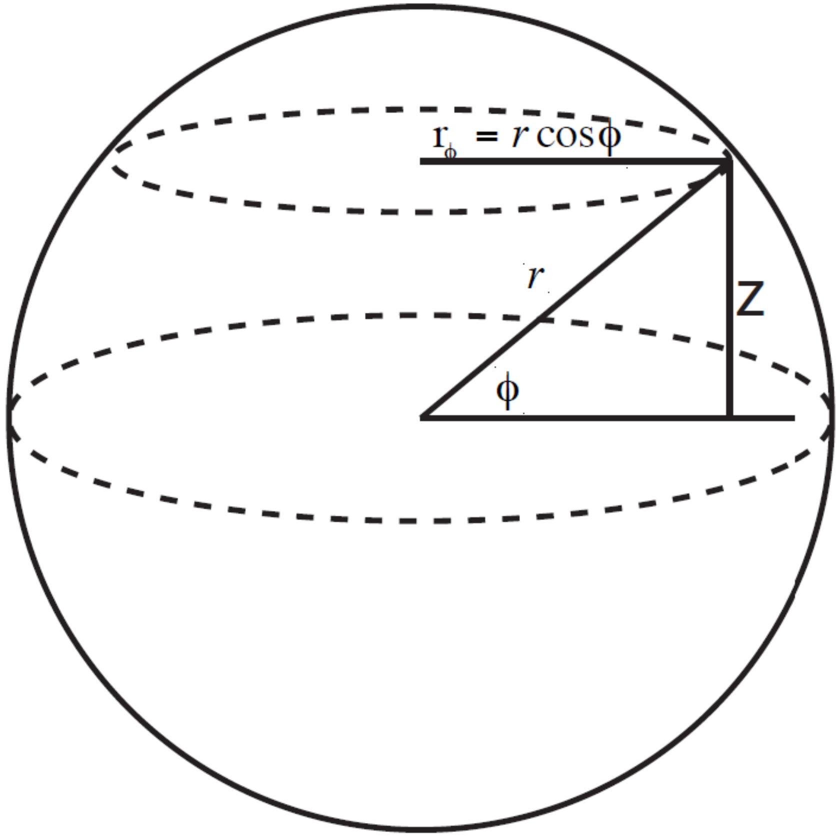
$$r_\varphi = r\cos\varphi$$

- and the z-value of all points on this circle is

$$z = r\sin\varphi$$

- But we know how to find points on a circle, so

$$x = r_\varphi \cos\theta = r\cos\varphi\cos\theta$$
$$y = r_\varphi \sin\theta = r\cos\varphi\sin\theta$$



Segments and Slices

- Using Quads , we need to setup our increments for the parametric equations

float inctheta = (2.0f*pi)/float(nSlices);

float incphi = pi/float(nSegments);

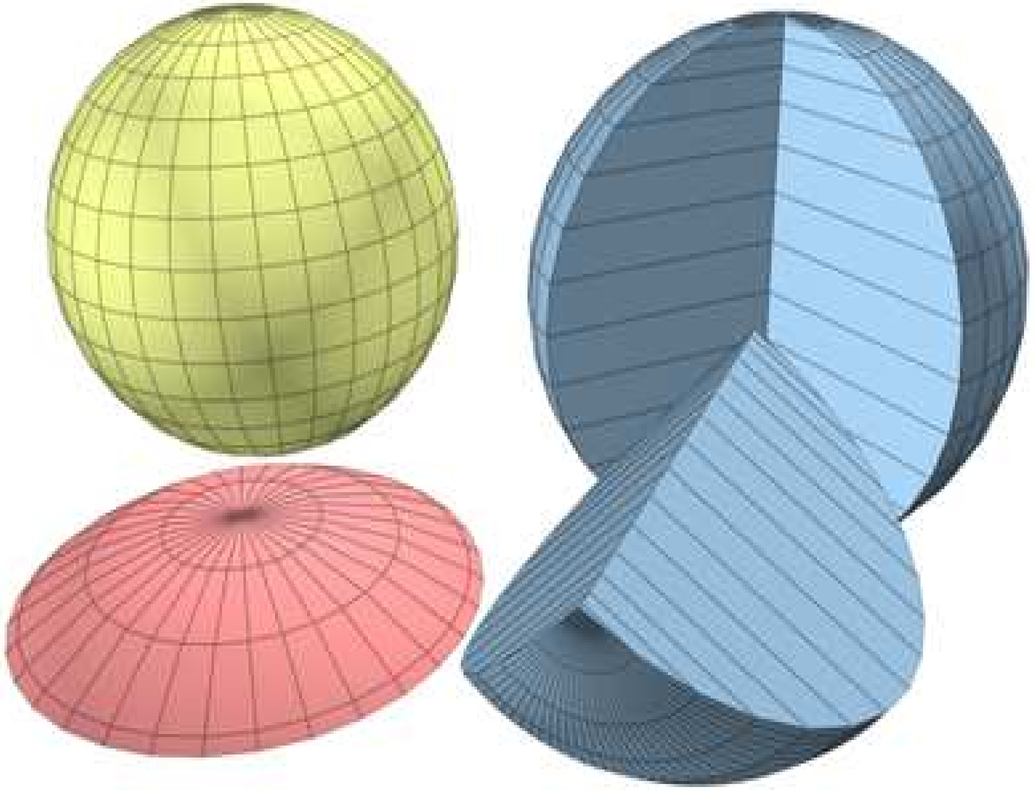
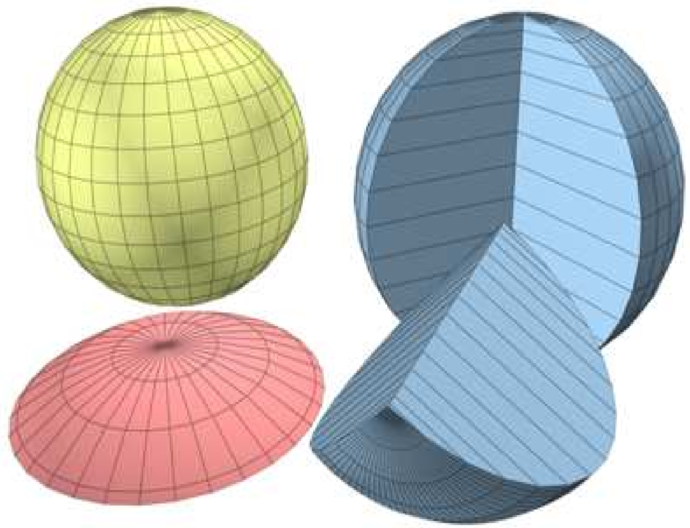


Image from Autodesk

Then we just need to loop

- Using two loops , we need to build up our sphere

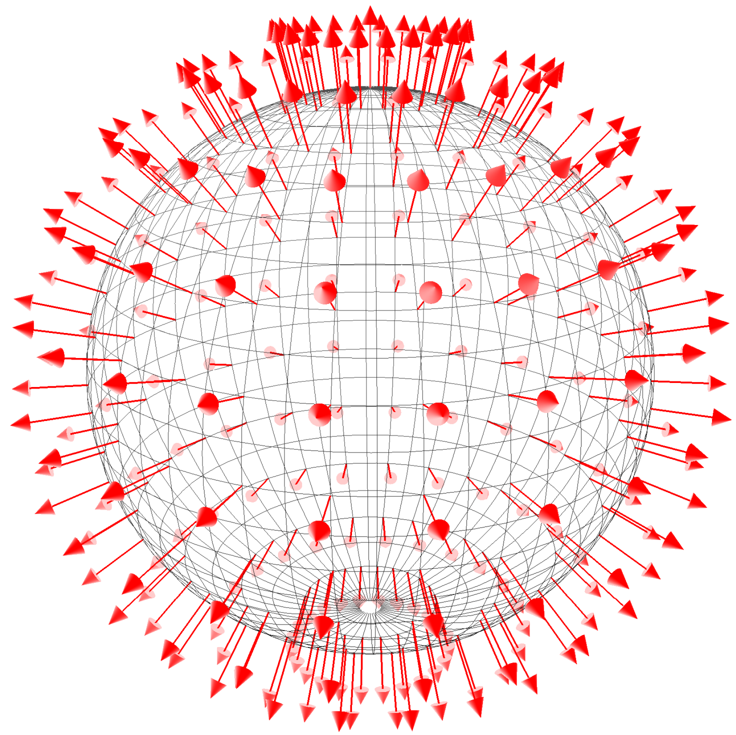


```
for(float theta=-pi; theta<pi; theta+=inctheta)
        {
            for(float phi=-(pi/2.0f); phi<(pi/2.0f); phi+=incphi)
                    {
                            .......
                    }
        }
```

What about our Normals?

- Well , if we have our origin at 0 ,0
- Then every point on our sphere is also if changed to a vector is own normal e.g

```
glNormal3f(x,y,z);
glVertex3f(x,y,z);
```



Rejbrand Encyclopædia of Curves and Surfaces