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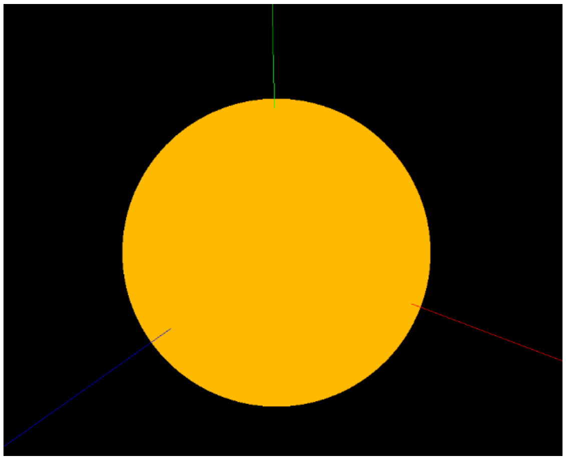
Problem 2

Lighting….. Ambient Intensity = 1.0

```
_light_source1._lightPos = glm::vec4(20.0,20.0,0.0,0.0);
_light_source1._ambient_intensity = 1.0;
_light_source1._specular_intensity = 0.0;
_light_source1._diffuse_intensity = 0.0;
_light_source1._attenuation_coeff = 0.0;
```

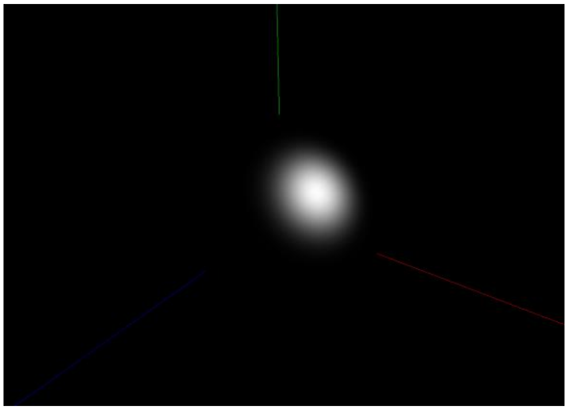
When ambient intensity is affected (with all other sources held to zero), the 3D object appears to be 2-dimensional because there is no directionality to the light, therefore no part of the surface is illuminated to a larger magnitude than the rest. Adjusting the magnitude of the ambient intensity simply makes the object appear brighter or duller in color throughout.



Lighting….. Specular Intensity = 1.0

```
_light_source1._lightPos = glm::vec4(20.0,20.0,0.0,0.0);
_light_source1._ambient_intensity = 0.0;
_light_source1._specular_intensity = 1.0;
_light_source1._diffuse_intensity = 0.0;
_light_source1._attenuation_coeff = 0.0;
```

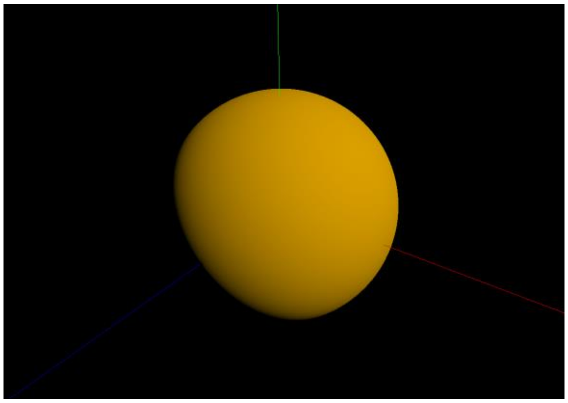
When specular intensity is affected (with all other sources held to zero), the 3D object is difficult to discern beyond the brief area of highlight which occurs in line with the spotlight. All other areas of the object receive no light and therefore do not appear beyond obscuring the axes beyond.



Lighting….. Diffuse Intensity = 1.0

```
_light_source1._lightPos = glm::vec4(20.0,20.0,0.0,0.0);
_light_source1._ambient_intensity = 0.0;
_light_source1._specular_intensity = 0.0;
_light_source1._diffuse_intensity = 1.0;
_light_source1._attenuation_coeff = 0.0;
```

When diffuse intensity is affected (with all other sources held to zero), the 3D object appears 2-dimensional and is fully obscured at a cutoff angle on the opposite side of the sphere from the light source. Because no light reaches beyond a certain point on the sphere, the rest falls into shadow.

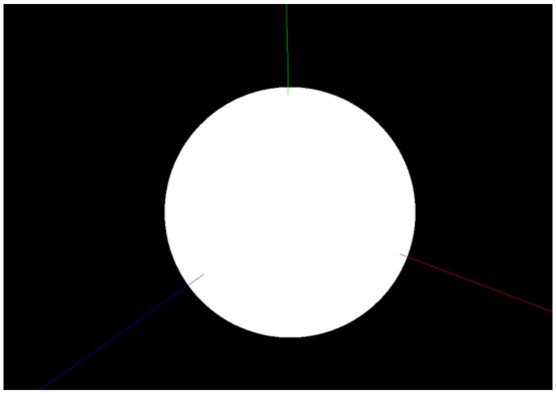


The attenuation coefficient affects ambient, specular, and diffuse intensity by adjusting the magnitude of each by a function of the distance from the light source to the object. It is clear from these tests, and from the homework solution provided, that a balance of the three light sources is imperative to illustrating depth in 3-dimensions for an object.

Material…. RGB adjustments

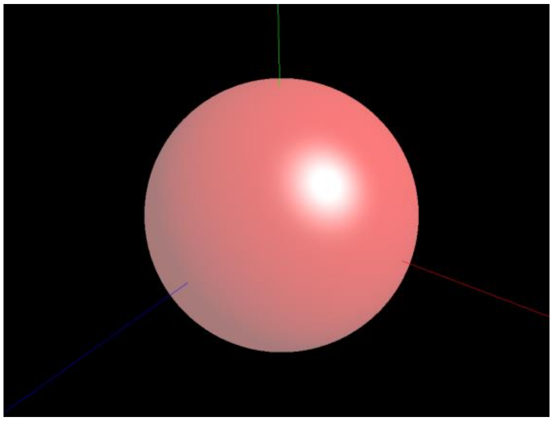
```
    _material._diffuse_material = glm::vec3(1.0, 1.0, 1.0);
    _material._ambient_material = glm::vec3(1.0, 1.0, 1.0);
    _material._specular_material = glm::vec3(1.0, 1.0, 1.0);
    _material._shininess = 12.0;
```

The vec3 values refer to Red, Green, Blue combinations (respectively). When all are set to the same value, the object appears 2-dimensional as there is no color differentiation in the various light materials even when the ambient, specular, and diffuse magnitudes are set to provide dimension. When all are set specifically to 1.0, the resulting color is white.



```
    _material._diffuse_material = glm::vec3(1.0, 0.0, 0.0);
    _material._ambient_material = glm::vec3(1.0, 0.5, 0.5);
    _material._specular_material = glm::vec3(1.0, 1.0, 1.0);
    _material._shininess = 12.0;
```

When the first vec3 value is set to 1.0, and the others are varied, red becomes the dominant color, but variations in the color of light sources (as well as the magnitude of light intensity for ambient, diffuse, and specularity), allows the sphere to appear 3-dimensional.



Geometry

```
//// Create some models

    // coordinate system
    CoordSystem* cs = new CoordSystem(40.0);

       GLSphereDirect* sphere_diffuse = new GLSphereDirect(0.0, 0.0, 0.0, 5.0, 90, 50);
```

In main_spotlight.cpp, the dimension and location of the sphere can be adjusted under the pointer call shown above. The first 3 values provide the domain for the x,y,z location of the sphere. The fourth number provides the radius dimension (or size) of the sphere, and the final values provide resolution and segmentation of the sphere.