

# Lecture 10: Sphere Illumination Examples

October 3, 2019

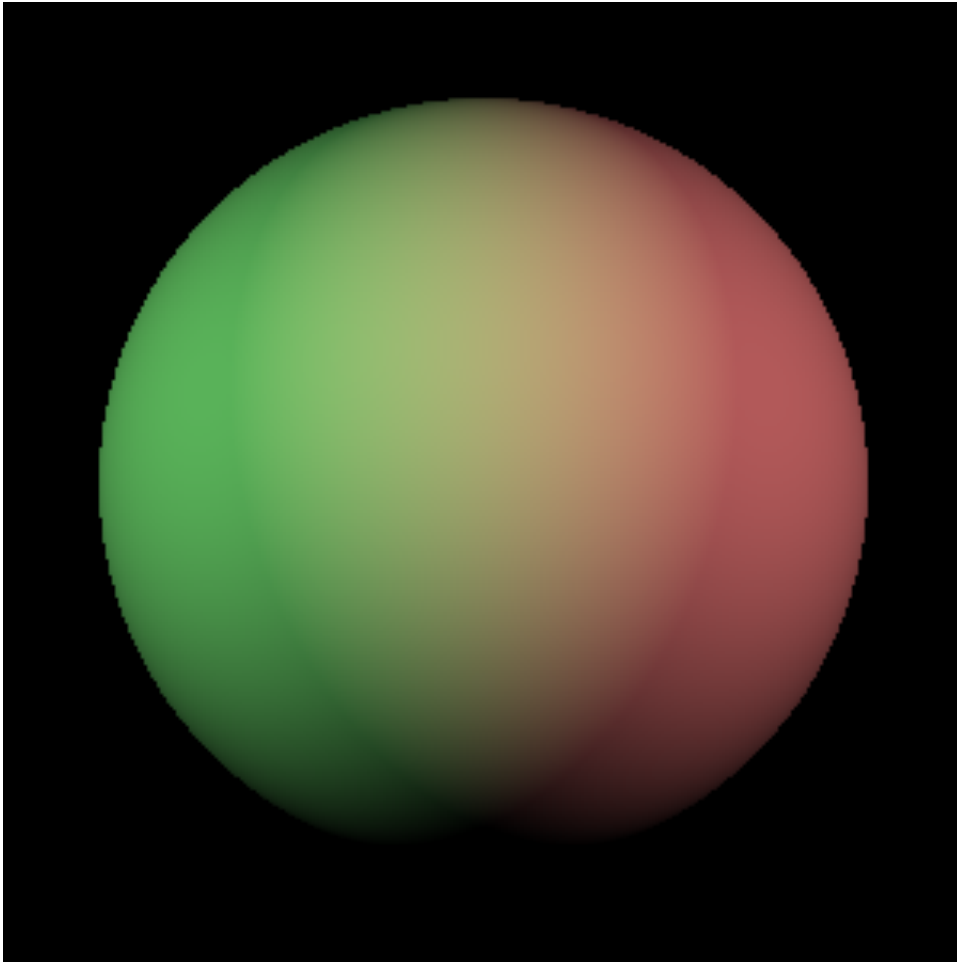
# Overview

- This was not a PowerPoint based lecture
- Instead, examples using SageMath notebook `cs410lec08n01`.
- However, images from the preparation for the lecture were captured in advance and are presented here as a partial record.
- Keep in mind the images from lecture are gone, so what is here is close but not a full match.

# Summary of Examples

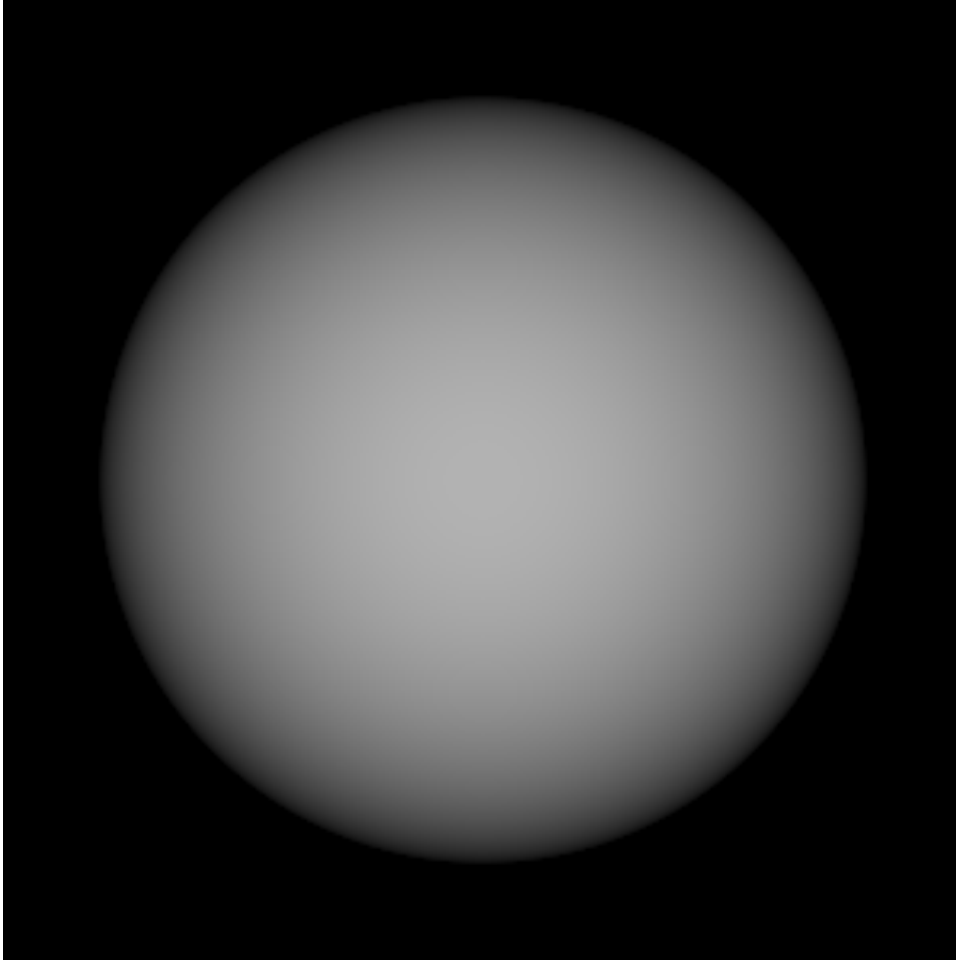
Example	Description
Ex00	The defaults with two lights sources and a grey sphere in the center of the field of view
Ex01	Single white light source at the eye position. No ambient light
Ex02	Single white light source at the eye position, turn up the emission on the light to 2.0
Ex03	Same as example 01 but with white ambient light added and 0.7 ka values
Ex04	Same as example 01 but with light moved to the left of the sphere but light at 1.5
Ex05	Same as example 02 but with light moved to upper left and behind and ambient at 0.5
Ex06	Same as example 05 but with sunlight yellow at (2.0, 2.0, 1.0)
Ex07	Same as example 06 but with light directly behind the sphere and ambient at 1.0
Ex08	Same as example 07 but with light at (25, 400, -1200)
Ex09	Single yellow light source at the eye position illuminating a grey sphere, no ambient
Ex10	Single white light source at the eye position illuminating a yellow sphere, no ambient
Ex11	Same as ex10 but adding a blue reflectance only for a strong added ambient component
Ex12	At red, green and blue light source all at the eye position, no ambient light
Ex13	Now spread light along the horizontal axes, red -40 and blue +40
Ex14	Same as example 13 but add in white ambient light of 1.0 with ka of 0.35
Ex15	Same as example 14 but with red, green and blue lights turned up to 10.0
Ex16	Same as example 15 buth with kr constants reduced by a factor of ten to 0.07
Ex17	Same as example 13 but with the green light source inside the sphere
Ex18	Same as example 17 both with white light sources and ambient dialed back to 0.1
Ex19	Same as example 18 but remove test on light source surface normal dot product sign
Ex20	Off axis wide angle with eye 5 units from radius 4 sphere center. Bounds plus minus 4 with near only -2

# Base Case: Example 00



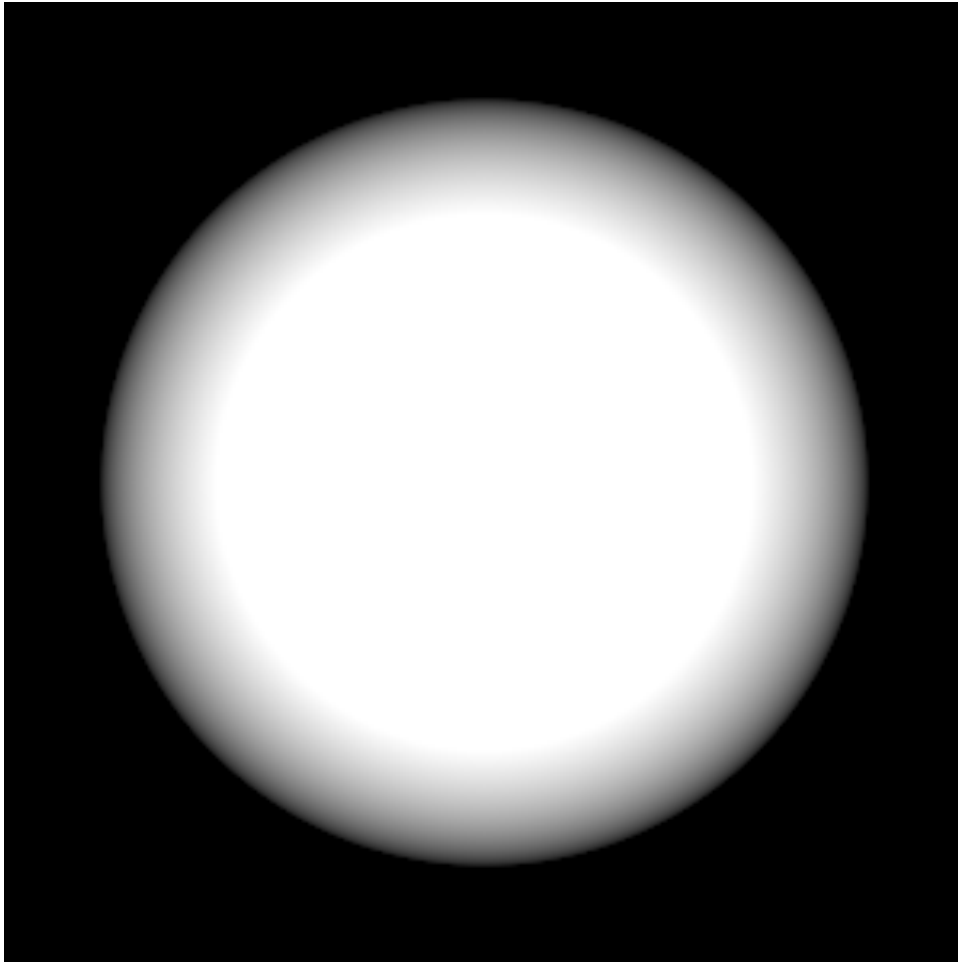
The defaults with two lights sources and a grey sphere in the center of the field of view

# Base Case: Example 01



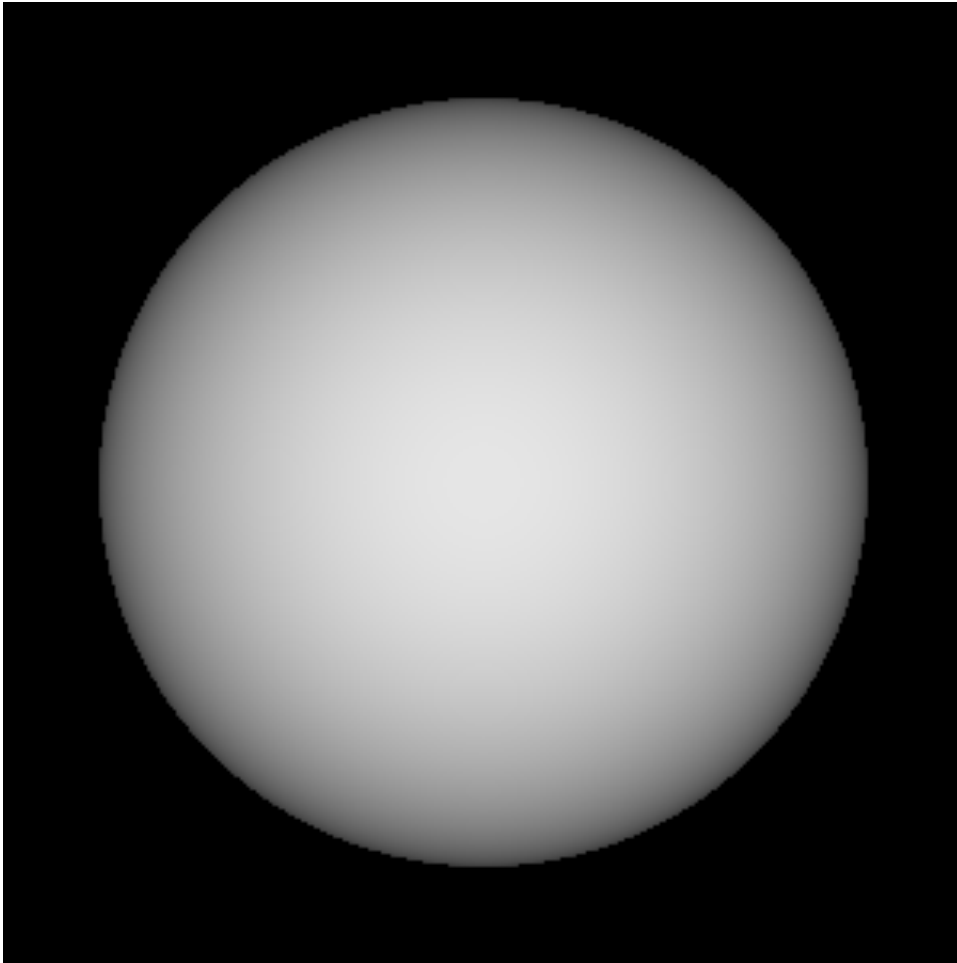
Single white light source at the eye position. No ambient light

# Base Case: Example 02



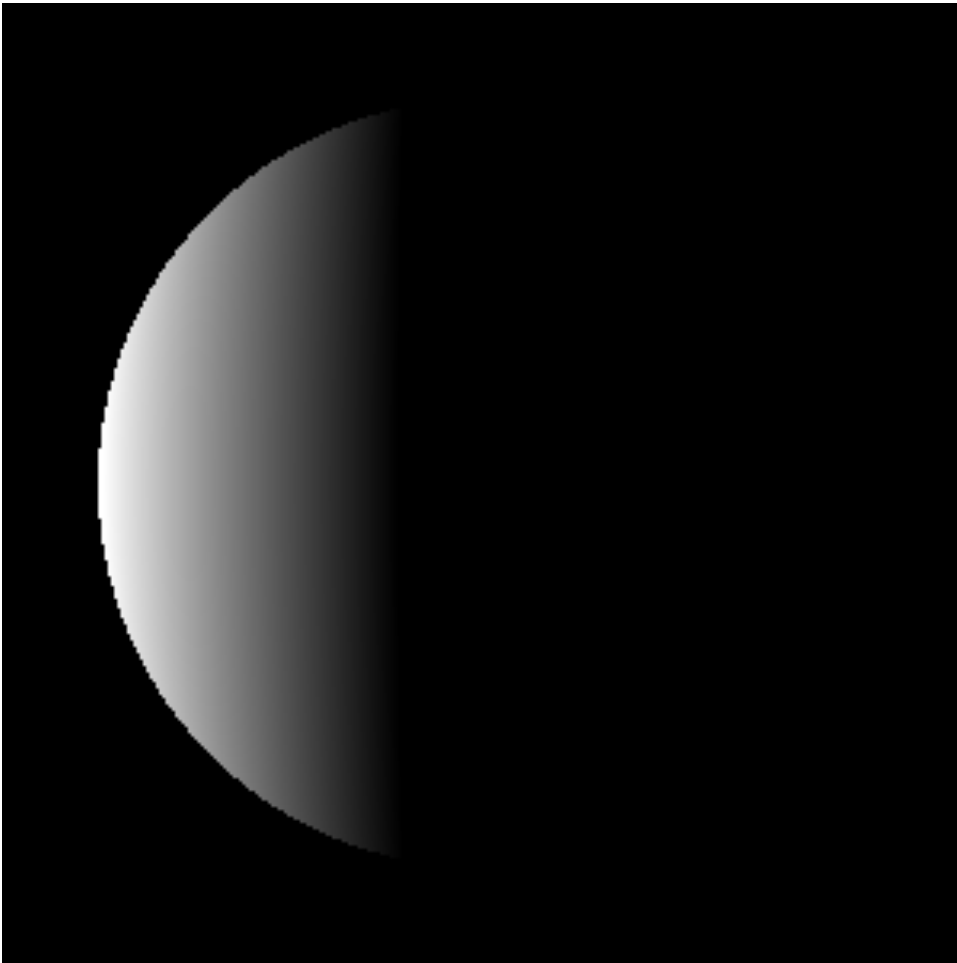
Single white light source at the eye position, turn up the emission on the light to 2.0

# Base Case: Example 03



Same as example 01 but with white ambient light added and 0.7 ka values

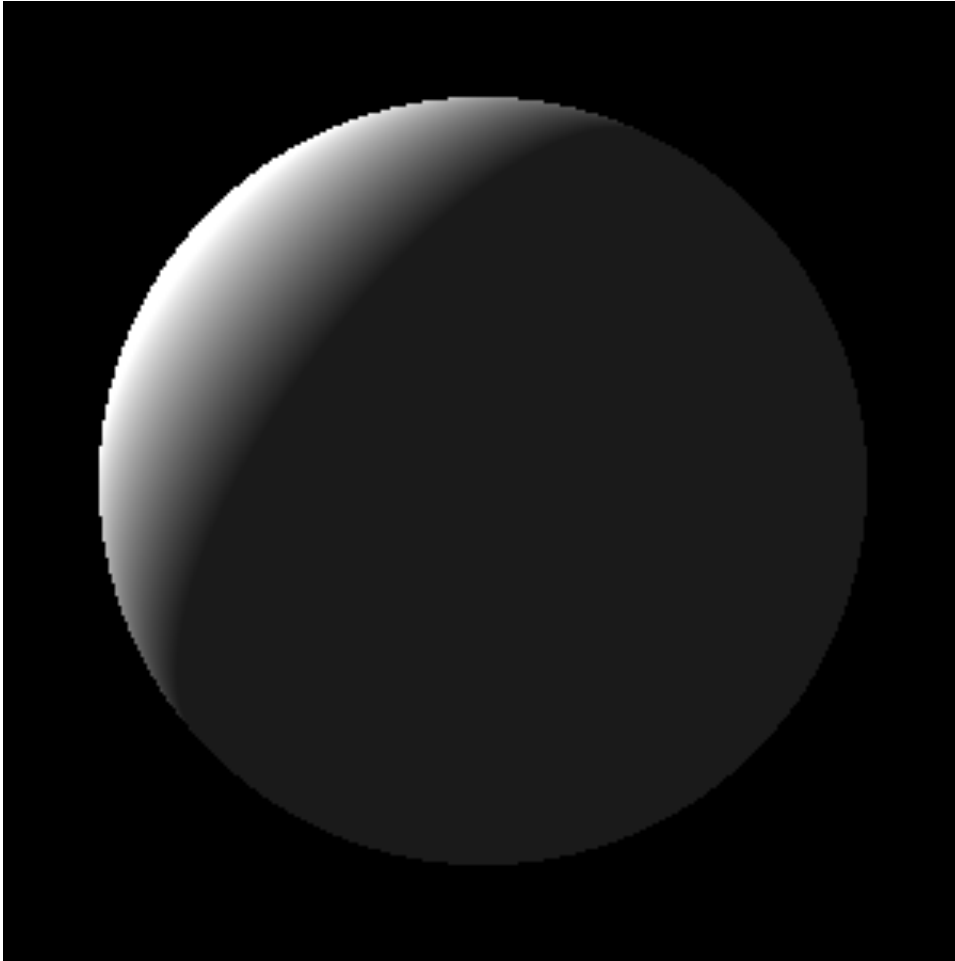
# Base Case: Example 04



Same as example 01 but with light moved to the left of the sphere but light at 1.5

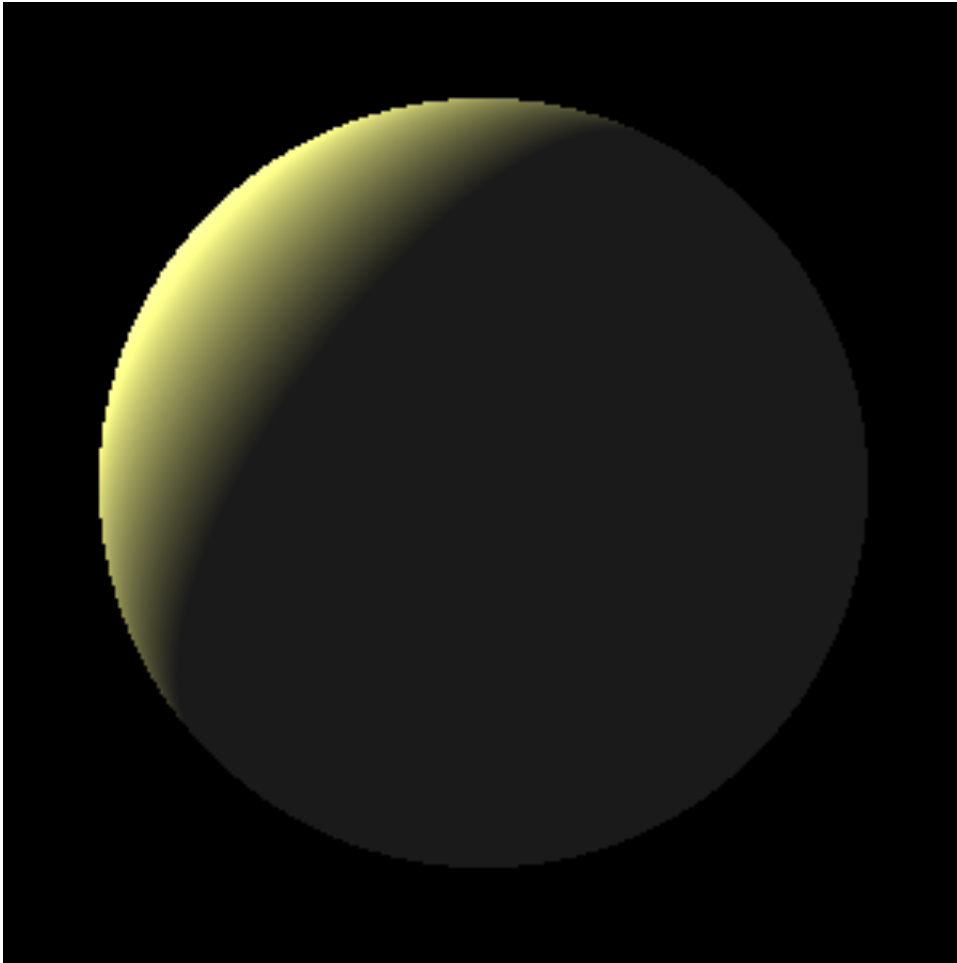


# Base Case: Example 05



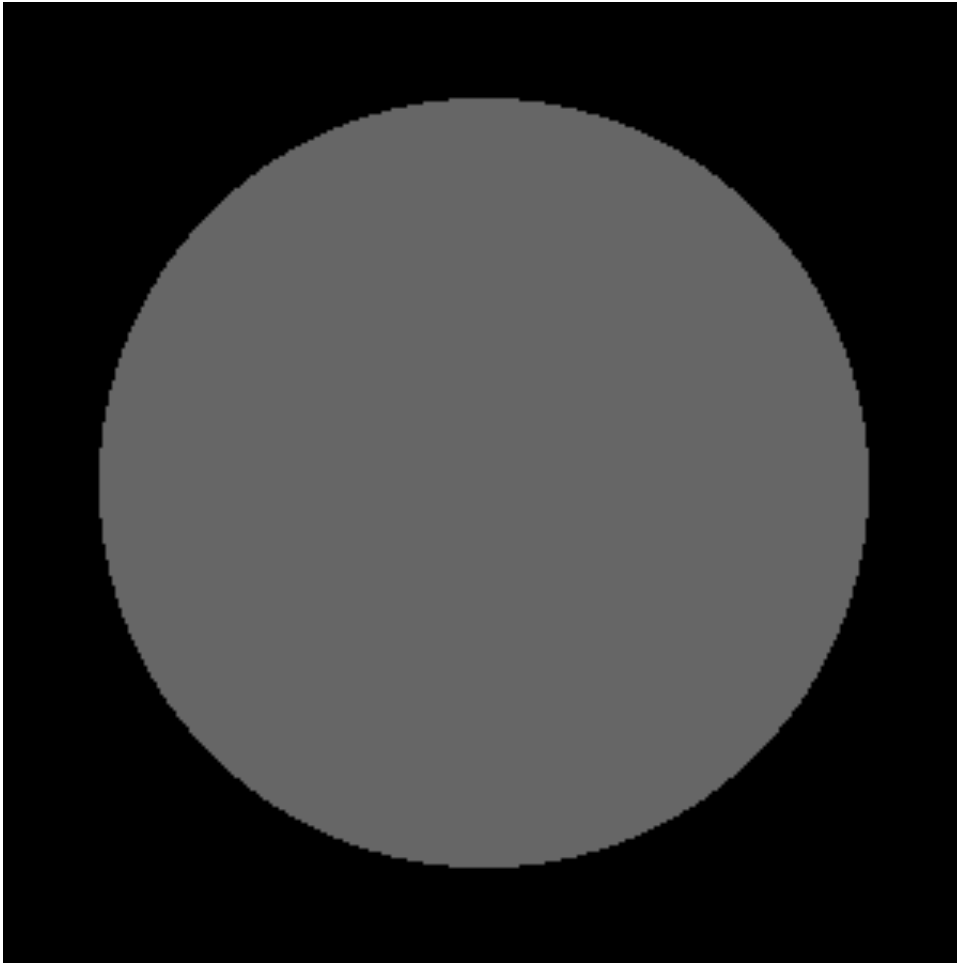
Same as example 02 but with light moved to upper left and behind and ambient at 0.5

# Base Case: Example 06



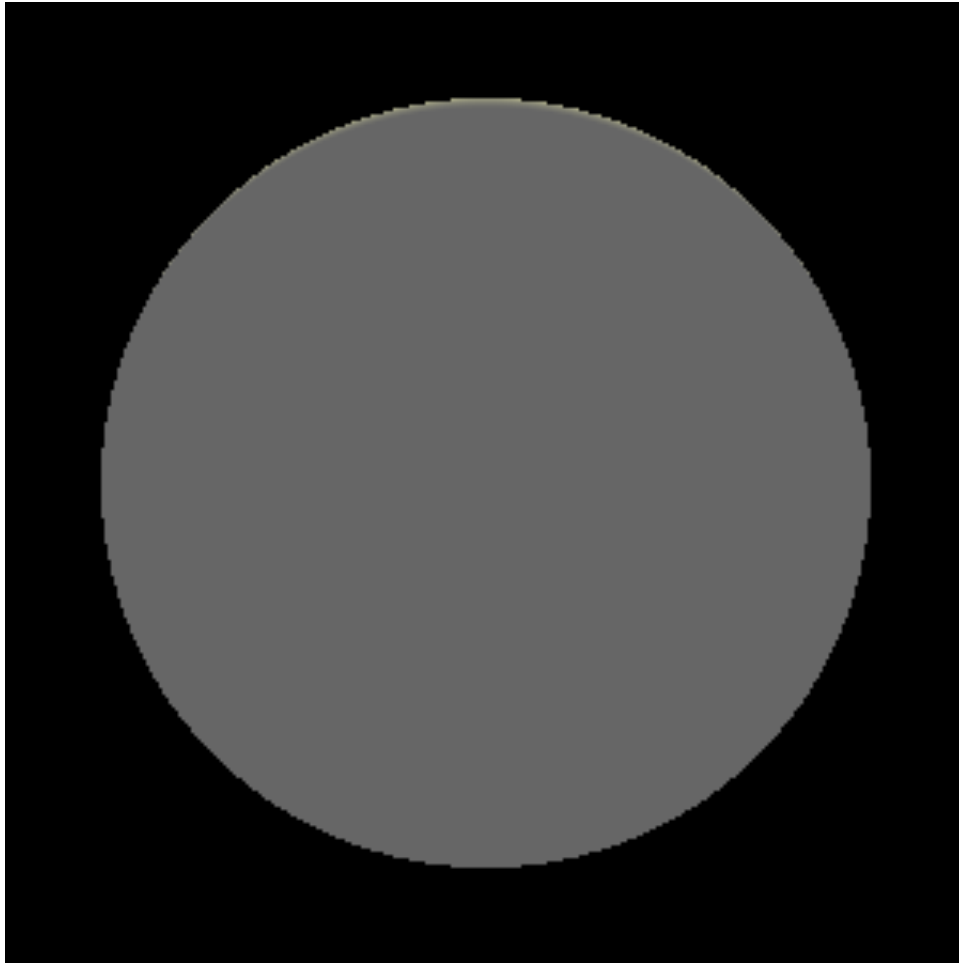
Same as example  
05 but with sunlight  
yellow at (2.0, 2.0,  
1.0)

# Base Case: Example 07



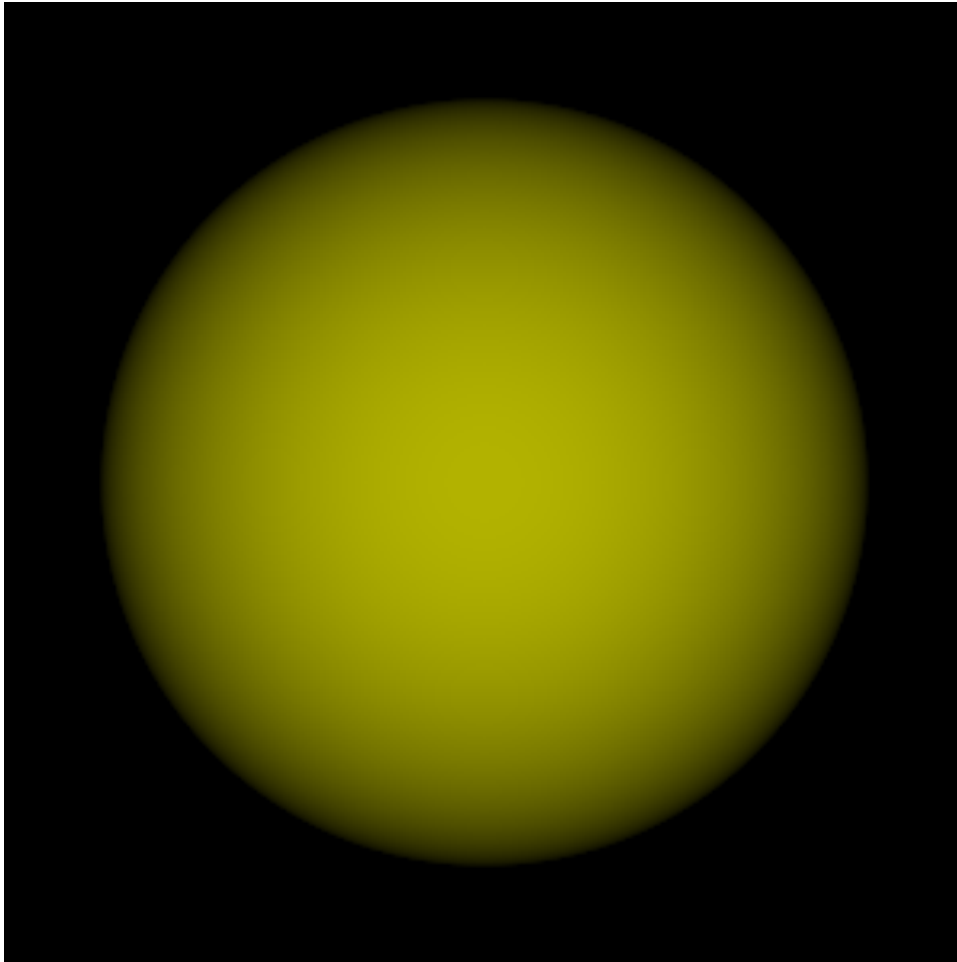
Same as example 06 but with light directly behind the sphere and ambient at 1.0

# Base Case: Example 08



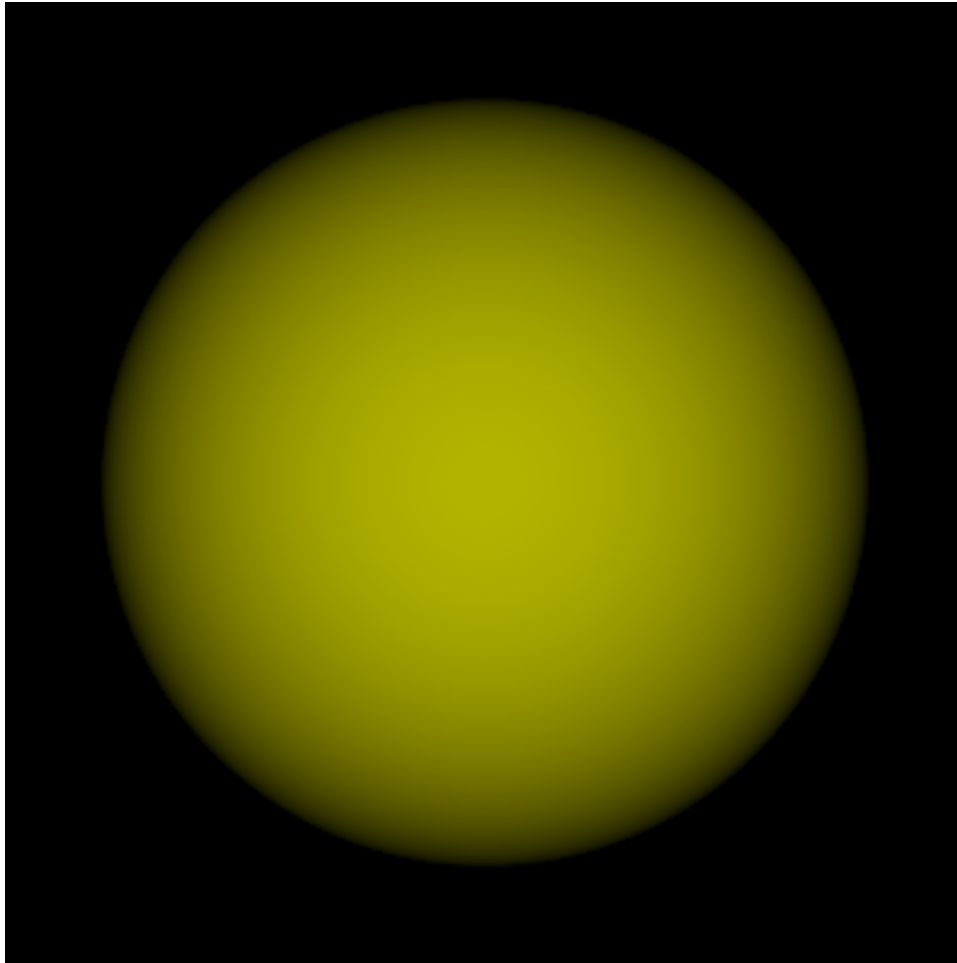
Same as example  
07 but with light at  
(25, 400, -1200)

# Base Case: Example 09



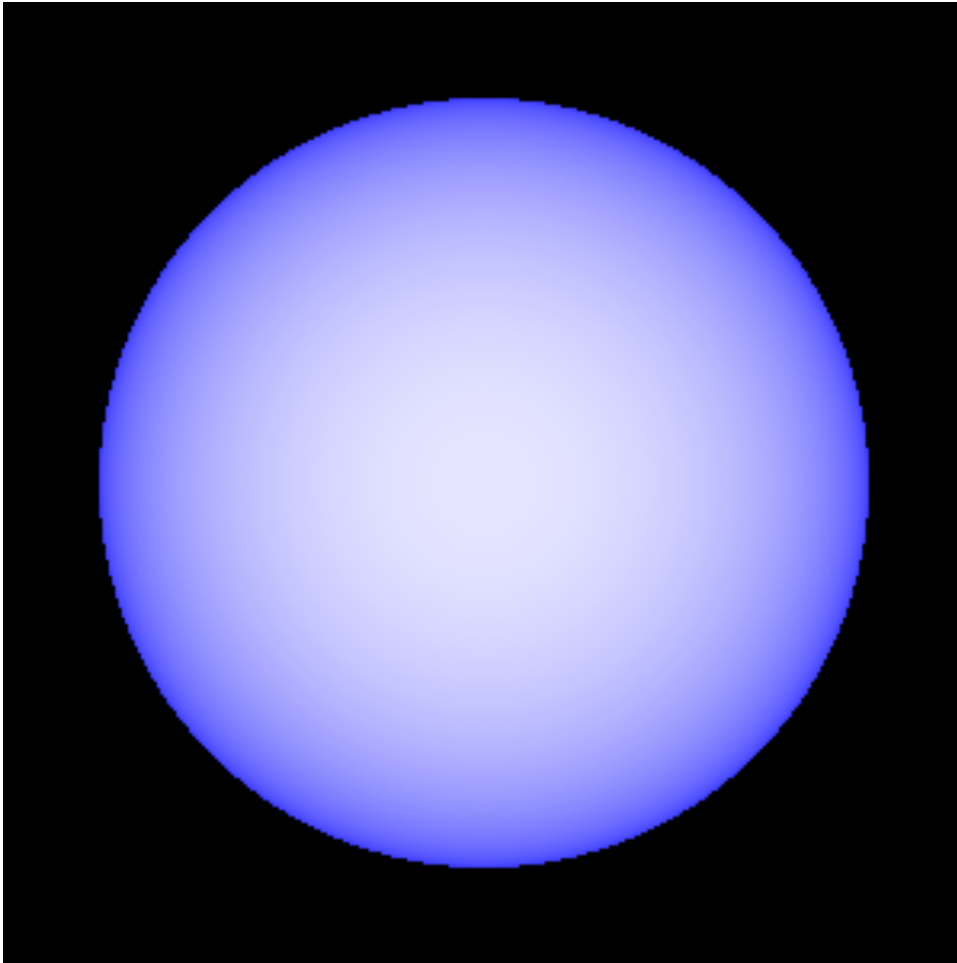
Single yellow light source at the eye position illuminating a grey sphere, no ambient

# Base Case: Example 10



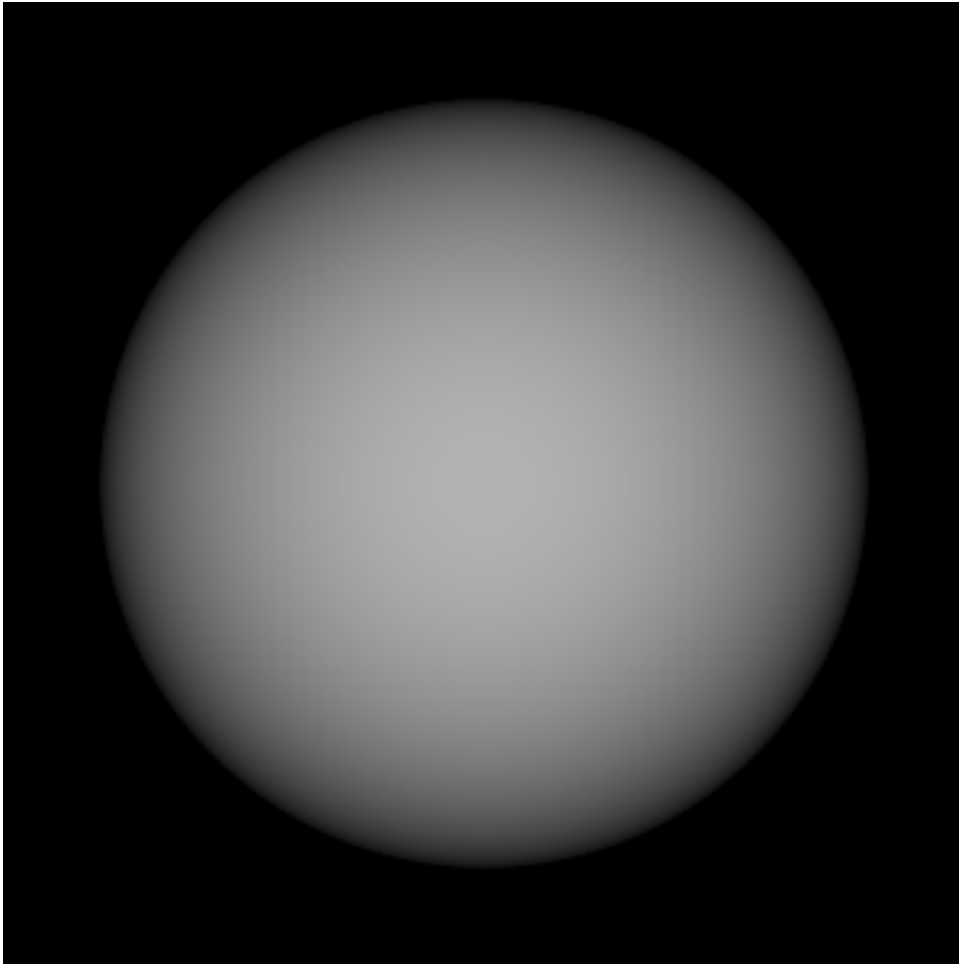
Single white light source at the eye position illuminating a yellow sphere, no ambient

# Base Case: Example 11



Same as ex10 but adding a blue reflectance only for a strong added ambient component

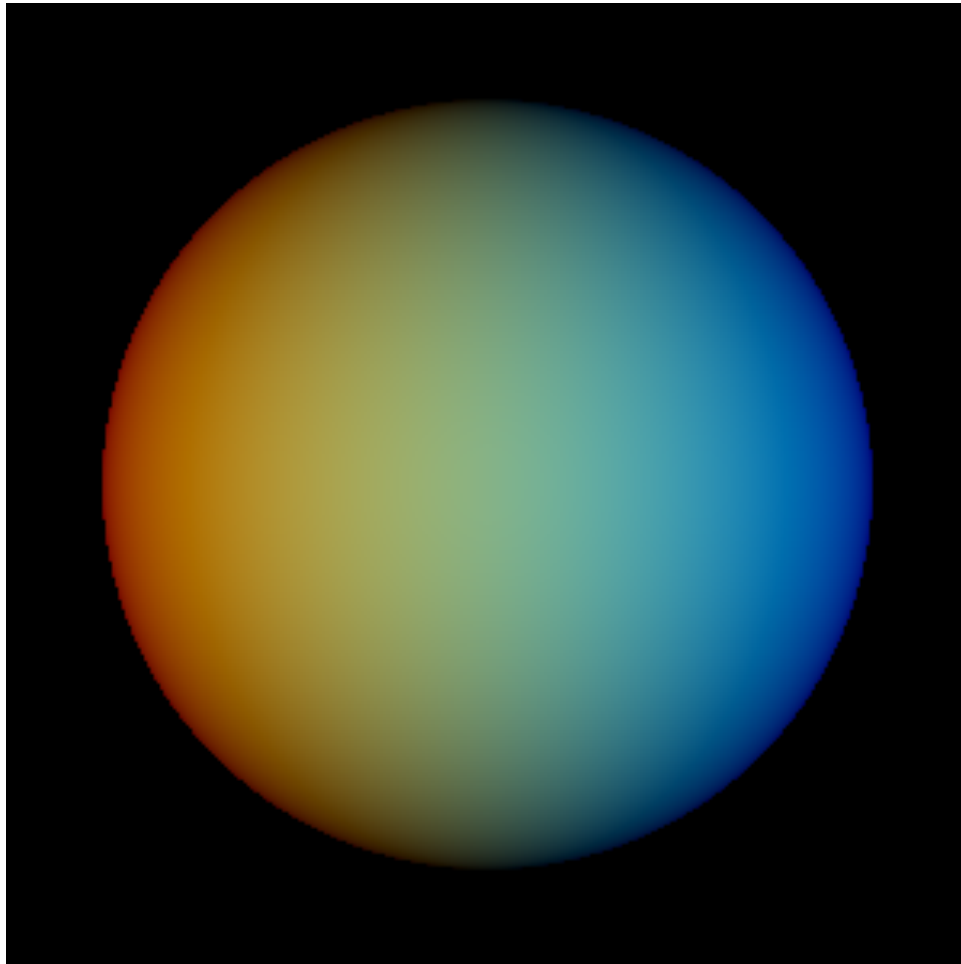
# Base Case: Example 12



A red, green and blue light source all at the eye position, no ambient light

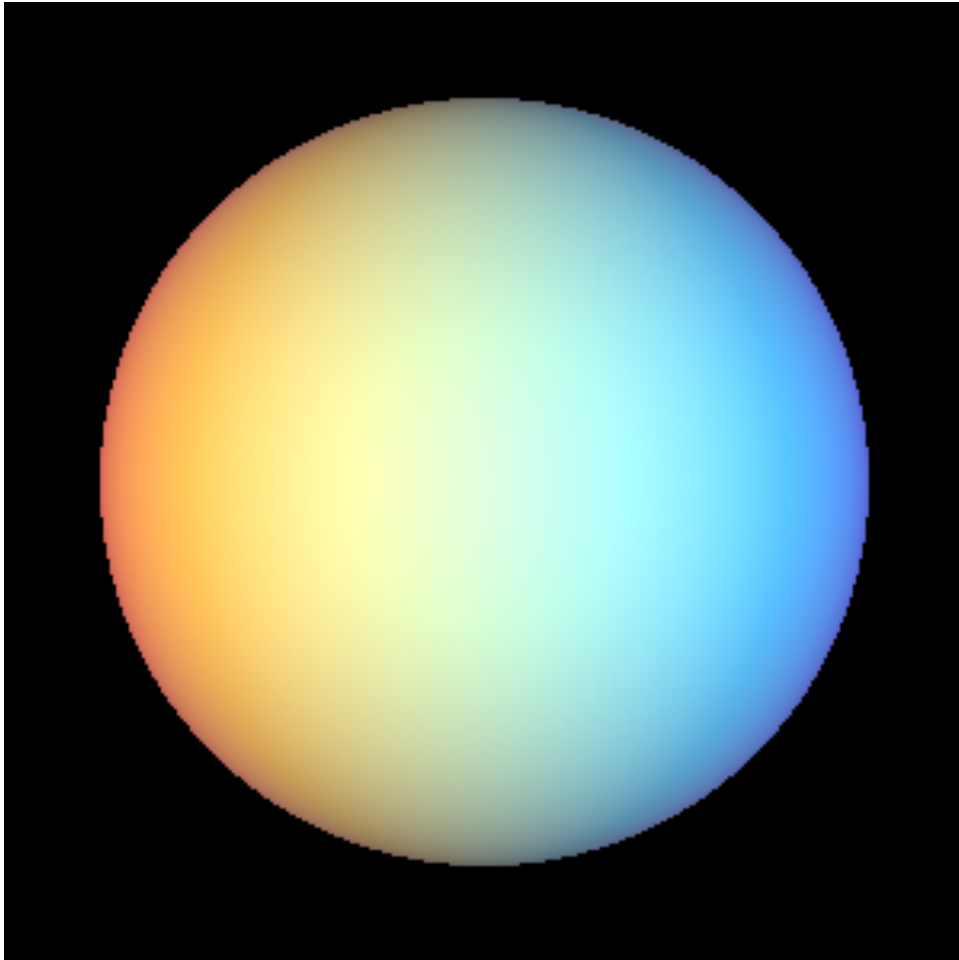


# Base Case: Example 13



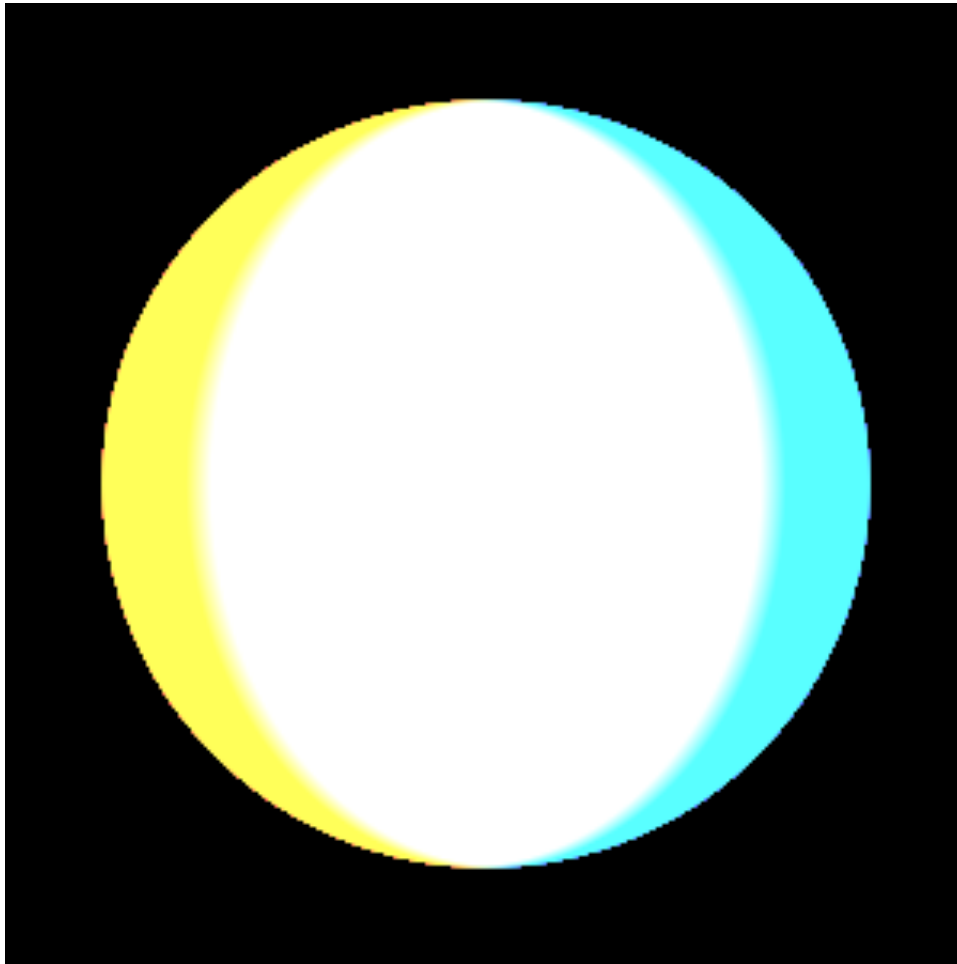
Example 12 but  
spreading light  
sources along the  
horizontal axes, red  
-40 and blue +40

# Base Case: Example 14



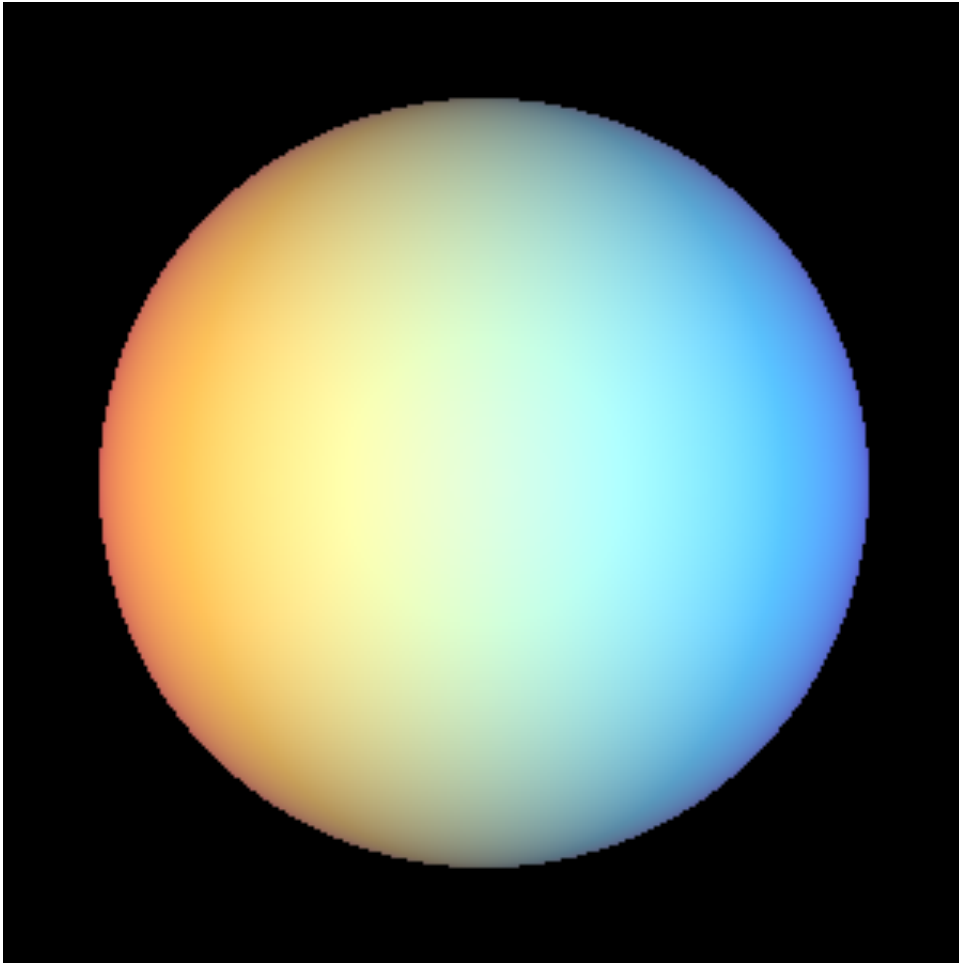
Same as example  
13 but add in white  
ambient light of 1.0  
with  $k_a$  of 0.35

# Base Case: Example 15



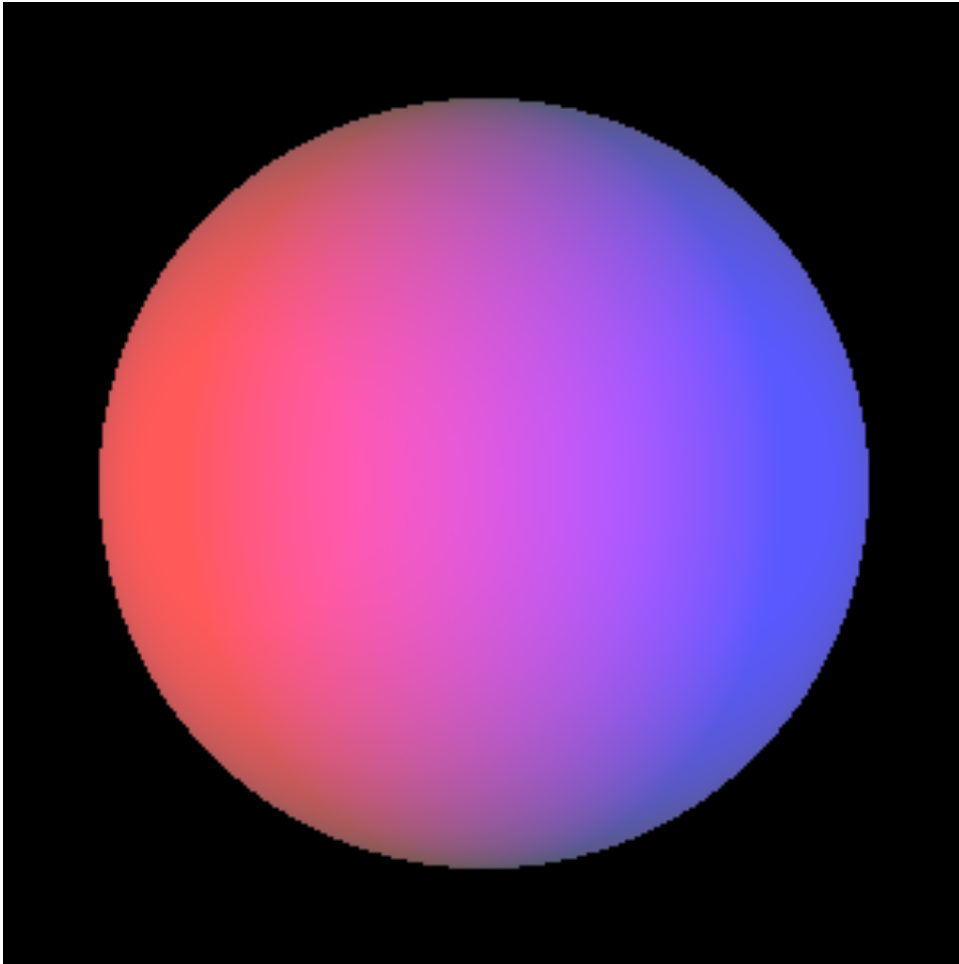
Same as example 14 but with red, green and blue lights turned up to 10.0

# Base Case: Example 16



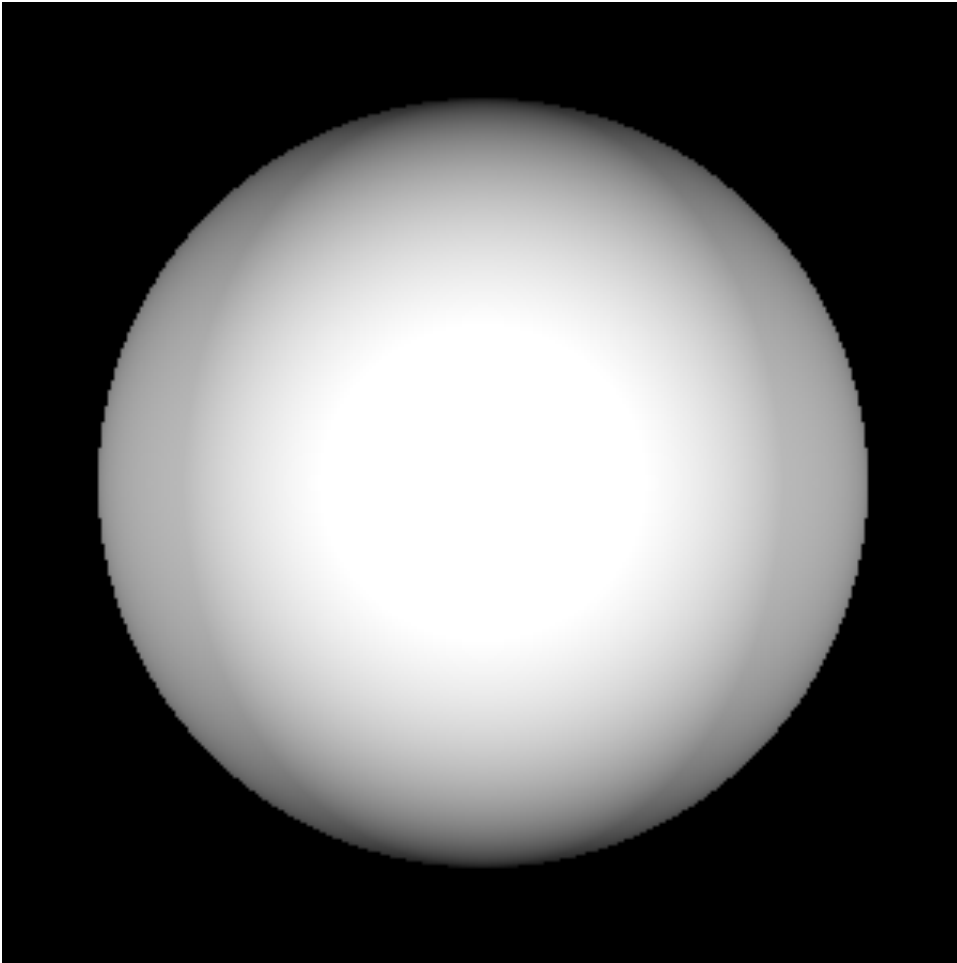
Same as example 15 but with  $k_r$  constants reduced by a factor of ten to 0.07

# Base Case: Example 17



Same as example 13 but with the green light source inside the sphere

# Base Case: Example 18



Same as example 17 but with white light sources and ambient dialed back to 0.1

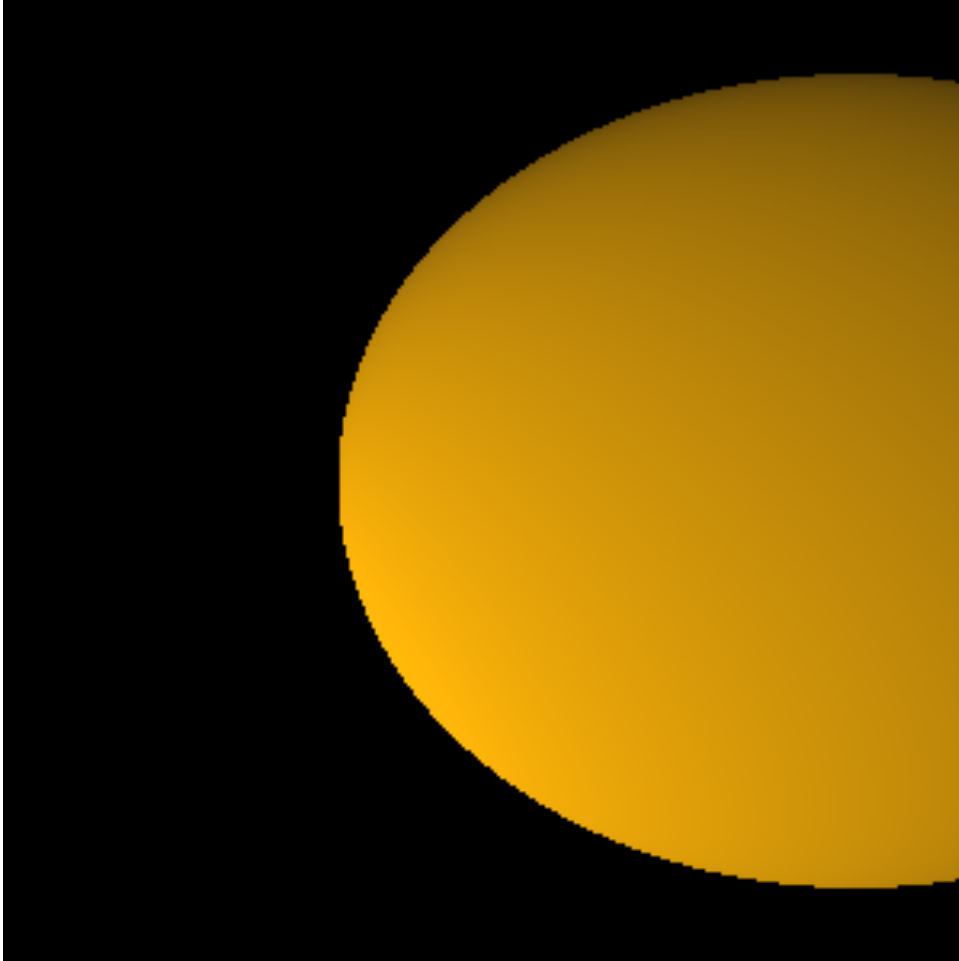
# Base Case: Example 19



Same as example 18 but remove test on light source surface normal dot product sign.

Note the rendering is NOT correct.

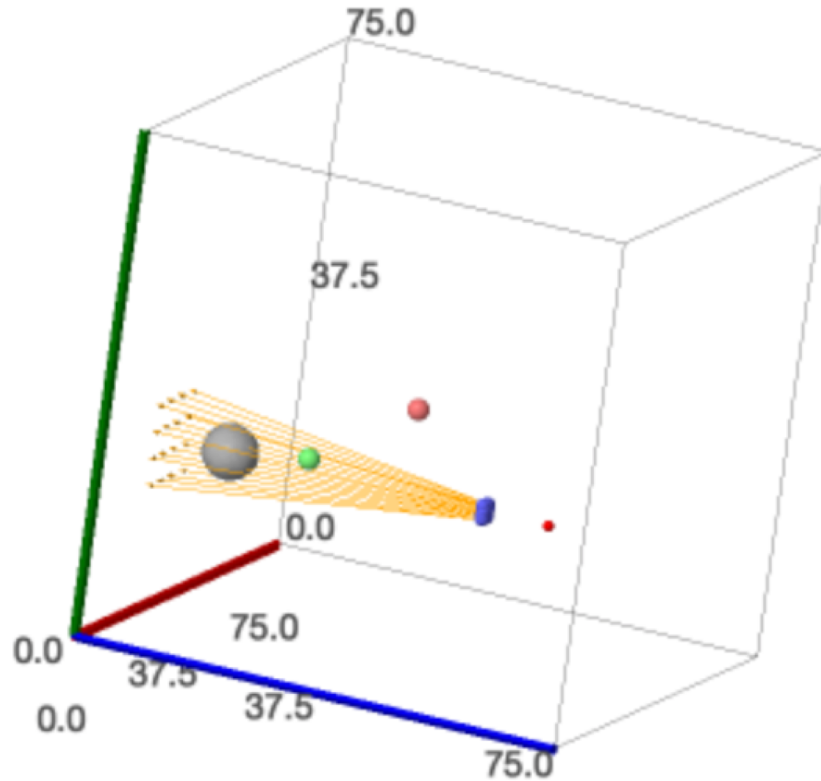
# Base Case: Example 20



Off axis wide angle  
with eye 5 units  
from radius 4  
sphere center.  
Bounds plus minus  
4 with near only -2  
Note the sphere no  
longer appears  
round.



# One More Thing



I forgot to mention in lecture, or demonstrate, that if you set the width and height to 8 or less the SageMath notebook creates a 3D illustration of the scene. This includes the image plane (blue), eye location (red), the rays leaving the image plane, and the sphere. Also, the light sources are shown as spheres rendered in the color of the light source.