HW5

Challenge 1b

The normal vector $[N_x \; N_y \; N_z]$ is calculated using the following formula, where (x, y) is the position of the brightest pixel and $(Center_x, Center_y)$ is the centroid of the sphere's projection.

$$\begin{cases} N_x = x - Center_x \\ N_y = y - Center_y \\ N_z = \sqrt{Radius^2 - (N_x)^2 - (N_y)^2} \end{cases}$$

Recall the irradiance formula:

$$E = \frac{J\cos\theta}{r^2}$$

When $\theta = 0$, the irradiance is at its maximum. Therefore, it is safe to assume that the normal vector of the brightest location and the light source are parallel.

Challenge 1d

I use all five images for this part since there are some outliers when using just three.