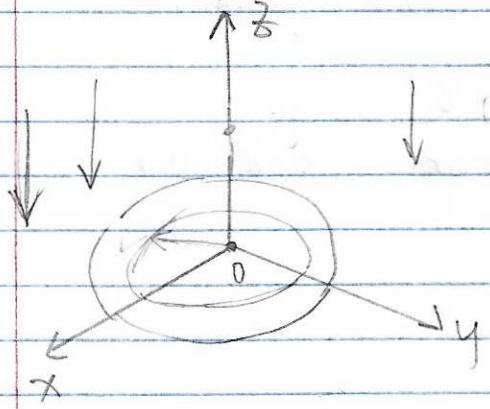
P3/ the torus is diffuse



We are using a distant point light source model.

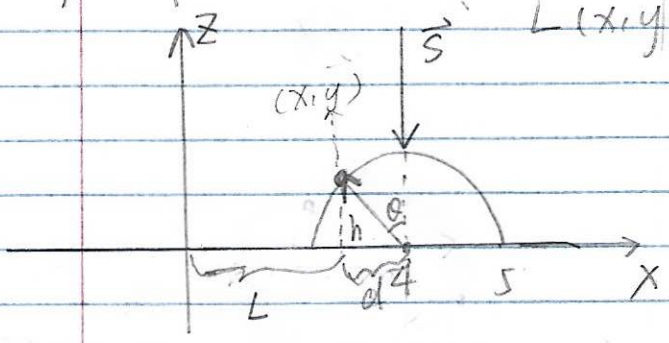
$$L = \rho \vec{N} \cdot \vec{S}$$

We assume the light has unit intensity.

$N(x,y)$ denote the normal at the point (x,y)

angle between $\vec{S}$ & $\vec{N}$ denotes $\langle \vec{N}, \vec{S} \rangle$

x-z plane's shown below



$$L(x,y) = \rho \cdot |N(x,y)| \cdot |S| \cos\langle \vec{N}, \vec{S} \rangle$$

We suppose $\langle \vec{N}, \vec{S} \rangle \in [0, \frac{\pi}{2}]$

$\cos\theta = h$

$L = \sqrt{x^2+y^2}$

$d = |4 - \sqrt{x^2+y^2}|$

$h^2 = 1 - d^2$

$= 1 - (4 - \sqrt{x^2+y^2})^2$

$h = \sqrt{1 - (4 - \sqrt{x^2+y^2})^2}$

So, $L(x,y) = \rho \cdot \cos(\vec{N}, \vec{S})$

$= \rho \sqrt{1 - (4 - \sqrt{x^2+y^2})^2}$