



$$\sin(\theta) = \frac{y}{\sqrt{x^2 + y^2}} = \frac{y}{r} = \sin(\theta) \quad y = \rho \sin(\phi) \sin(\theta)$$

$$\sin(\phi) = \frac{\sqrt{x^2 + y^2}}{\sqrt{x^2 + y^2 + z^2}} = \rho \sin(\phi) = r$$

$$\cos(\theta) = \frac{x}{\sqrt{x^2 + y^2}} = \rho \sin(\phi) \cos(\theta) = x$$

$$\cos(\phi) = \frac{z}{\rho} \quad z = \rho \cos(\phi)$$

$$x = \rho \sin(\phi) \cos(\theta)$$

$$y = \rho \sin(\phi) \sin(\theta)$$

$$z = \rho \cos(\phi)$$

$$\phi = \cos^{-1} \left( \frac{z}{\sqrt{x^2 + y^2 + z^2}} \right)$$

$$\theta = \tan^{-1} \frac{y}{x}$$

$$\rho = \sqrt{x^2 + y^2 + z^2}$$

$$\rho = \frac{y}{\sin \phi \sin \theta}$$

$$z \sin \theta$$

$$x = \frac{y \cdot \cos \theta}{\sin \phi \sin \theta}$$

Q2

$$-1 \leq x^n \leq 1$$

$$-1 \leq y^n \leq 1$$

$$-1 \leq z^n \leq 1$$

$$-w/2 \leq w/2 x^n \leq w/2$$

$$-H/2 \leq -H/2 y^n \leq H/2$$

$$-1/2 \leq z^n/2 \leq 1/2$$

y bounds flipped

$$-w/2 + w/2 \leq w/2 x^n \leq w/2 + w/2 \leq w - 1/2$$

$$-H/2 + H/2 - 1/2 \geq -H/2 y^n - 1/2 + H/2 \geq -1/2$$

$$-1/2 \leq z^n/2 + 1/2 \leq 1$$



$$\begin{bmatrix} w/2 & 0 & 0 & (w-1)/2 \\ 0 & -H/2 & 0 & (H-1)/2 \\ 0 & 0 & 0.5 & 0.5 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{matrix} x^n \\ y^n \\ z^n \\ 1 \end{matrix}$$