CS-485 Computer Graphics

Spherical coordinates for point ***P(ρ, θ, φ)*** on the surface of a sphere:

$\boldsymbol{\rho}$ = *distance* from ***P*** to the origin; $\boldsymbol{\rho} \geq 0$
$\boldsymbol{\theta}$ = *azimuthal* angle in the x-z plane measured from the z-axis; $0 \leq \boldsymbol{\theta} < 2\pi$
$\boldsymbol{\varphi}$ = *polar* angle measured from the y-axis; $0 \leq \boldsymbol{\varphi} \leq \pi$

$\boldsymbol{x} = \boldsymbol{\rho} \sin \boldsymbol{\theta} \sin \boldsymbol{\varphi}$
$\boldsymbol{y} = \boldsymbol{\rho} \cos \boldsymbol{\varphi}$
$\boldsymbol{z} = \boldsymbol{\rho} \cos \boldsymbol{\theta} \sin \boldsymbol{\varphi}$

$\boldsymbol{\rho} = \sqrt{x^2 + y^2 + z^2}$
$\boldsymbol{\theta} = \tan^{-1}(\boldsymbol{x}/\boldsymbol{z})$
$\boldsymbol{\varphi} = \cos^{-1}(\boldsymbol{y}/\boldsymbol{\rho})$