Cartesian

$$\hat{\boldsymbol{\imath}} = (1,0,0)$$
$$\hat{\boldsymbol{\jmath}} = (0,1,0)$$
$$\hat{\boldsymbol{k}} = (0,0,1)$$

Cylidrical

Cylindrical $\to$ Cartesian

$$\begin{cases} x = \rho\cos\varphi \\ y = \rho\sin\varphi \\ z = z \end{cases}$$
$$\rho = \sqrt{x^2+y^2}$$

Volume element

$$\mathrm{d}V = \rho\,\mathrm{d}\rho\,\mathrm{d}\varphi\,\mathrm{d}z$$

Spherical $\to$ Cylindrical

$$\begin{cases} \rho = r\sin\theta \\ \varphi = \varphi \\ z = r\cos\theta \end{cases}$$

Spherical

Spherical $\to$ Cartesian

$$\begin{cases} x = r\ \sin\theta\ \cos\varphi \\ y = r\ \sin\theta\ \sin\varphi \\ z = r\ \cos\theta \end{cases}$$
$$r^2 = x^2+y^2+z^2$$

Volume element

$$\mathrm{d}V = r^2\sin\theta\,\mathrm{d}r\,\mathrm{d}\theta\,\mathrm{d}\varphi$$
$$\int_{\varphi=0}^{2\pi}\int_{\theta=0}^{\pi}\int_{r=0}^{\infty} f(r,\theta,\varphi) r^2\sin\theta\,\mathrm{d}r\ \mathrm{d}\theta\ \mathrm{d}\varphi.$$

Spherical unit coordinates

$$\hat{\boldsymbol{r}} = \sin(\theta)\cos(\varphi)\hat{\boldsymbol{\imath}} + \sin(\theta)\sin(\varphi)\hat{\boldsymbol{\jmath}} + \cos(\theta)\hat{\boldsymbol{k}}$$
$$\hat{\boldsymbol{\theta}} = \cos(\theta)\cos(\varphi)\hat{\boldsymbol{\imath}} + \cos(\theta)\sin(\varphi)\hat{\boldsymbol{\jmath}} - \sin(\theta)\hat{\boldsymbol{k}}$$
$$\hat{\boldsymbol{\varphi}} = -\sin(\varphi)\hat{\boldsymbol{\imath}} + \cos(\varphi)\hat{\boldsymbol{\jmath}}$$