- Polar $\to$ Rectangular
  $(r, \theta) \to (x, y)$

$$x = r\cos\theta \qquad y = r\sin\theta$$

- Rectangular $\to$ Polar
  $(x, y) \to (r, \theta)$

$$r^2 = x^2 + y^2 \qquad \theta = \arctan\frac{y}{x}$$

- Cylindrical $\to$ Rectangular
  $(r, \theta, z) \to (x, y, z)$

$$x = r\cos\theta \qquad y = r\sin\theta \qquad z = z$$

- Rectangular $\to$ Cylindrical
  $(x, y, z) \to (r, \theta, z)$

$$r^2 = x^2 + y^2 \qquad \theta = \arctan\frac{y}{x} \qquad z = z$$

- Spherical $\to$ Rectangular
  $(\rho, \theta, \phi) \to (x, y, z)$

$$x = \rho\sin\phi\cos\theta \qquad y = \rho\sin\phi\sin\theta \qquad z = \rho\cos\phi$$

- Rectangular $\to$ Spherical
  $(x, y, z) \to (\rho, \theta, \phi)$

$$\rho^2 = x^2 + y^2 + z^2 \qquad \theta = \arctan\frac{y}{x}$$
$$\phi = \arctan\left(\frac{\sqrt{x^2+y^2}}{z}\right) = \arccos\left(\frac{z}{\sqrt{x^2+y^2+z^2}}\right) = \arccos\left(\frac{z}{\rho}\right)$$

- Spherical $\to$ Cylindrical
  $(\rho, \theta, \phi) \to (r, \theta, z)$

$$r = \rho\sin\phi \qquad \theta = \theta \qquad z = \rho\cos\phi$$

- Cylindrical $\to$ Spherical
  $(r, \theta, z) \to (\rho, \theta, \phi)$

$$\rho = \sqrt{r^2 + z^2} \qquad \theta = \theta$$
$$\phi = \arctan\left(\frac{r}{z}\right) = \arcsin\left(\frac{r}{\sqrt{r^2+z^2}}\right) = \arccos\left(\frac{z}{\sqrt{r^2+z^2}}\right)$$