EXERCISES #1

OVERVIEW, COORDINATE SYSTEMS

Exercise 1. Find the rectangular coordinates (in 2D) of the point $(r, \theta) = (2, \frac{\pi}{4})$ in polar coordinates.

Exercise 2. Find the polar coordinates of the point $(x, y) = (1, -1)$ in rectangular coordinates (in 2D).

Exercise 3. Find the rectangular coordinates (in 3D) of the point $(r, \theta, z) = (4, \frac{4\pi}{3}, 1)$ in cylindrical coordinates.

Exercise 4. Find the cylindrical coordinates of the point $(x, y, z) = (0, -1, 3)$ in rectangular coordinates (in 3D).

Exercise 5. Explain why $\rho = \sqrt{r^2 + z^2}$ (in the context of expressing spherical coordinates in terms of cylindrical coordinates).

Exercise 6. Convert the point $(x, y, z) = (0, -2, 0)$ in rectangular coordinates (in 3D) to spherical coordinates.

Exercise 7. Convert the point $(\rho, \theta, \phi) = (2, \frac{\pi}{4}, \frac{\pi}{4})$ to rectangular coordinates (in 3D).

Exercise 8. Express the equation $\phi = \frac{\pi}{4}$, in spherical coordinates, of the cone in terms of cylindrical coordinates.

Exercise 9. Consider a vertical line (in 2D) through the point $(3, 3)$ (expressed in rectangular coordinates). Decide if the line would be more easily expressed in polar coordinates or in rectangular coordinates. Then write an equation for it.