

MATH 251: Practice 16

June 24, 2015

Name: Solutions.

1. Convert the point $(1, 1, 2)$ to both cylindrical and spherical coordinates.

$$r = \sqrt{2}$$

$$\rho = \sqrt{1+1+4} = \sqrt{6}$$

$$\theta = \pi/4$$

$$\theta = \pi/4$$

$$z = 2$$

$$\varphi = (\cos^{-1}(2/\sqrt{6}))$$

2. Convert the equation $z^2 = x^2 + y^2$ into spherical coordinates.

$$\rho^2 \cos^2 \varphi = \rho^2 \sin^2 \varphi \cos^2 \theta + \rho^2 \sin^2 \varphi \sin^2 \theta$$

$$\rho^2 \cos^2 \varphi = \rho^2 \sin^2 \varphi$$

$$\cos^2 \varphi = \sin^2 \varphi$$

$$\boxed{\varphi = \pi/4}$$

3. Write the equation $z = x^2 + y^2$ in both cylindrical and spherical coordinates. Which one is easier?

$$\boxed{z = r^2}$$

easier.

$$\rho \cos \varphi = \rho^2 \sin^2 \varphi$$

$$\rho = \frac{\cos \varphi}{\sin^2 \varphi}$$