

Q1. Convert the point P(1,3,5) from Cartesian to Cylindrical and Spherical polar coordinates

Given:- X= 1; Y= 3; Z=5

Formula:- Cylindrical- Cartesian $r = \sqrt{x^2 + y^2}$; $\phi = \tan^{-1} \left(\frac{y}{x} \right)$; $z = z$

Spherical-Cartesian;

$$r = \sqrt{x^2 + y^2 + z^2}; \theta = \tan^{-1} \left(\frac{\sqrt{x^2 + y^2}}{z} \right); \phi = \tan^{-1} \left(\frac{y}{x} \right)$$

Solution:-

In cylindrical polar coordinates, (r, ϕ , z)

$$r = \sqrt{x^2 + y^2} = \sqrt{1^2 + 3^2} = \sqrt{10} = 3.162$$

$$\phi = \tan^{-1} \left(\frac{y}{x} \right) = \tan^{-1}(3) = 71.57$$

$$Z = 5$$

In Spherical polar coordinates (r, θ , ϕ)

$$r = \sqrt{x^2 + y^2 + z^2} = \sqrt{1^2 + 3^2 + 5^2} = \sqrt{35} = 5.916$$

$$\phi = \tan^{-1} \left(\frac{y}{x} \right) = \tan^{-1}(3) = 71.57$$

$$\theta = \tan^{-1} \left(\frac{\sqrt{x^2 + y^2}}{z} \right) = \tan^{-1} \left(\frac{\sqrt{1^2 + 3^2}}{5} \right) = 32.3$$

Ans:- Coordinates of P in cylindrical coordinates are (3.162, 71.57, 5) and in spherical polar coordinates are (5.916, 71.57, 32.3)