0.0.1 Polar Coordinates

$P(r, \theta) = P(x, y)$

0.0.2 Spherical Coordinates

$P(\rho, \theta, \phi) = P(x, y, z)$

Definition: Vector Field

Let E be a subset of $\mathbb{R}^3$. A **vector field** on $\mathbb{R}^3$ if function F that assigns to each point (x, y, z) in E a three dimensional vector $F(x, y, z)$.

Definition: Divergence

Let $F(x, y, z) = (x, y, z), Q(x, y, z), R(x, y, z)\rangle$ be a vector field on $\mathbb{R}^3$ and suppose the partial derivatives exist,

$$\nabla \dot{F} = \langle \partial x, \partial y, \partial z \rangle \dot{\langle} P, Q, R \rangle.$$