Analysis II f. Ingenieure

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Folien:

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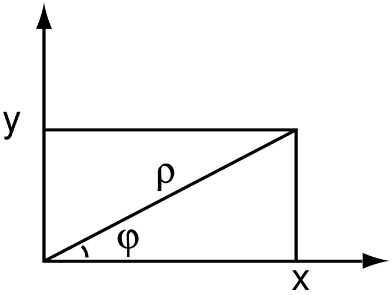
Ebene Polarkoordinaten

- Radius ρ, Winkel ϕ:

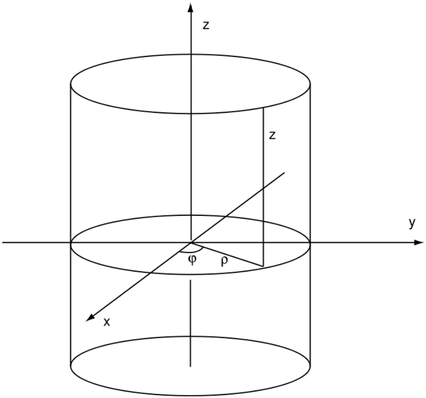
- $x = \rho \cos \phi$, $y = \rho \sin \phi$,
- $\frac{\partial x}{\partial \rho} = \cos \phi$, $\frac{\partial x}{\partial \phi} = -\rho \sin \phi$,
- $\frac{\partial y}{\partial \rho} = \sin \phi$, $\frac{\partial y}{\partial \phi} = \rho \cos \phi$.

- $\rho = \sqrt{x^2 + y^2}$,
- $\frac{\partial \rho}{\partial x} = \frac{x}{\rho}$, $\frac{\partial \rho}{\partial y} = \frac{y}{\rho}$,
- $\frac{\partial \phi}{\partial x} = -\frac{y}{\rho^2}$, $\frac{\partial \phi}{\partial y} = \frac{x}{\rho^2}$.



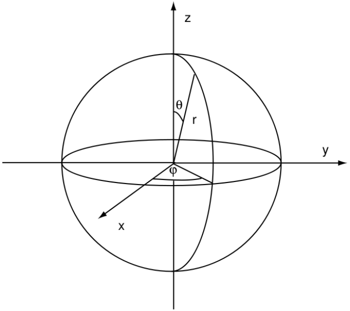
Zylinderkoordinaten

- Radius ρ, Winkel ϕ, Höhe z:
- $x = \rho \cos \phi$, $y = \rho \sin \phi$, $z = z$.



Kugelkoordinaten

- Radius r, geographische Breite θ, Länge ϕ:
- $x = r \sin\theta \cos\phi,\ y = r \sin\theta \sin\phi,\ z = r \cos\theta,$
- $\frac{\partial x}{\partial r} = \sin\theta \cos\phi,\ \frac{\partial x}{\partial \theta} = r \cos\theta \cos\phi,\ \frac{\partial x}{\partial \phi} = -r \sin\theta \sin\phi,$
- $\frac{\partial y}{\partial r} = \sin\theta \sin\phi,\ \frac{\partial y}{\partial \theta} = r \cos\theta \sin\phi,\ \frac{\partial y}{\partial \phi} = r \sin\theta \cos\phi,$
- $\frac{\partial z}{\partial r} = \cos\theta,\ \frac{\partial z}{\partial \theta} = -r \sin\theta,\ \frac{\partial z}{\partial \phi} = 0.$



- $r = \sqrt{x^2 + y^2 + z^2},$
- $\frac{\partial r}{\partial x} = \frac{x}{r},\ \frac{\partial r}{\partial y} = \frac{y}{r},\ \frac{\partial r}{\partial z} = \frac{z}{r},$
- $\frac{\partial \theta}{\partial x} = \frac{\cos\theta \cos\phi}{r},\ \frac{\partial \theta}{\partial y} = \frac{\cos\theta \sin\phi}{r},$

  $\frac{\partial \theta}{\partial z} = -\frac{\sin\theta}{r},$
- $\frac{\partial \phi}{\partial x} = -\frac{\sin\phi}{r \sin\theta},\ \frac{\partial \phi}{\partial y} = \frac{\cos\phi}{r \sin\theta},\ \frac{\partial \phi}{\partial z} = 0.$