



Item Navigation

Del in Cylindrical Coordinates

Determine the del operator ∇ in cylindrical coordinates. There are several ways to do this, but a straightforward, though algebraically lengthy one, is to transform from Cartesian coordinates using

$$\nabla = \hat{x} \frac{\partial}{\partial x} + \hat{y} \frac{\partial}{\partial y} + \hat{z} \frac{\partial}{\partial z},$$

$$\hat{x} = \cos \phi \hat{\rho} - \sin \phi \hat{\phi}, \quad \hat{y} = \sin \phi \hat{\rho} + \cos \phi \hat{\phi},$$

and

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

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