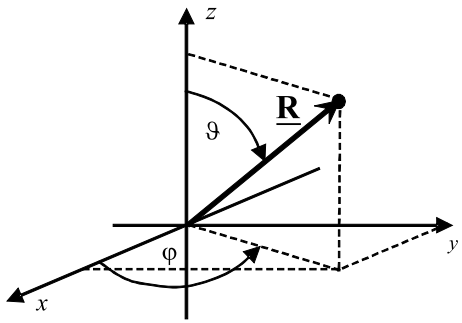
Koordinaten und Vektorkomponenten in verschiedenen Koordinatensystemen



Kartesische Koordinaten	Zylinderkoordinaten	Kugelkoordinaten
x	$r\cos\varphi$	$R\sin\vartheta\cos\varphi$
y	$r\sin\varphi$	$R\sin\vartheta\sin\varphi$
z	z	$R\cos\vartheta$
$\sqrt{x^2+y^2}$	r	$R\sin\vartheta$
$\arctan\frac{y}{x}$	φ	φ
z	z	$R\cos\vartheta$
$\sqrt{x^2+y^2+z^2}$	$\sqrt{r^2+z^2}$	R
$\arctan\frac{\sqrt{x^2+y^2}}{z}$	$\arctan\frac{r}{z}$	ϑ
$\arctan\frac{y}{x}$	φ	φ
$\underline{\mathbf{A}} = A_x\underline{\mathbf{e}}_x + A_y\underline{\mathbf{e}}_y + A_z\underline{\mathbf{e}}_z$	$\underline{\mathbf{A}} = A_r\underline{\mathbf{e}}_r + A_\varphi\underline{\mathbf{e}}_\varphi + A_z\underline{\mathbf{e}}_z$	$\underline{\mathbf{A}} = A_R\underline{\mathbf{e}}_R + A_\vartheta\underline{\mathbf{e}}_\vartheta + A_\varphi\underline{\mathbf{e}}_\varphi$
A_x	$A_r\cos\varphi - A_\varphi\sin\varphi$	$A_R\sin\vartheta\cos\varphi + A_\vartheta\cos\vartheta\cos\varphi - A_\varphi\sin\varphi$
A_y	$A_r\sin\varphi + A_\varphi\cos\varphi$	$A_R\sin\vartheta\sin\varphi + A_\vartheta\cos\vartheta\sin\varphi + A_\varphi\cos\varphi$
A_z	A_z	$A_R\cos\vartheta - A_\vartheta\sin\vartheta$
$A_x\cos\varphi + A_y\sin\varphi$	A_r	$A_R\sin\vartheta + A_\vartheta\cos\vartheta$
$-A_x\sin\varphi + A_y\cos\varphi$	A_φ	A_φ
A_z	A_z	$A_R\cos\vartheta - A_\vartheta\sin\vartheta$
$A_x\sin\vartheta\cos\varphi + A_y\sin\vartheta\sin\varphi + A_z\cos\vartheta$	$A_r\sin\vartheta + A_z\cos\vartheta$	A_R
$A_x\cos\vartheta\cos\varphi + A_y\cos\vartheta\sin\varphi - A_z\sin\vartheta$	$A_r\cos\vartheta - A_z\sin\vartheta$	A_ϑ
$-A_x\sin\varphi + A_y\cos\varphi$	A_φ	A_φ

Vektoranalytische Ausdrücke in verschiedenen Koordinatensystemen

	Kartesische Koordinaten	Zylinderkoordinaten	Kugelkoordinaten
$\underline{\mathbf{dR}}$	$\mathrm{d}x\underline{\mathbf{e}}_x + \mathrm{d}y\underline{\mathbf{e}}_y + \mathrm{d}z\underline{\mathbf{e}}_z$	$\mathrm{d}r\underline{\mathbf{e}}_r + r\mathrm{d}\varphi\underline{\mathbf{e}}_\varphi + \mathrm{d}z\underline{\mathbf{e}}_z$	$\mathrm{d}R\underline{\mathbf{e}}_R + R\mathrm{d}\vartheta\underline{\mathbf{e}}_\vartheta + R\sin\vartheta\mathrm{d}\varphi\underline{\mathbf{e}}_\varphi$
$\underline{\mathbf{dS}}$	$\underline{\mathbf{e}}_x\mathrm{d}y\mathrm{d}z + \underline{\mathbf{e}}_y\mathrm{d}x\mathrm{d}z + \underline{\mathbf{e}}_z\mathrm{d}x\mathrm{d}y$	$\underline{\mathbf{e}}_r r\mathrm{d}\varphi\mathrm{d}z + \underline{\mathbf{e}}_\varphi\mathrm{d}r\mathrm{d}z + \underline{\mathbf{e}}_z r\mathrm{d}r\mathrm{d}\varphi$	$\underline{\mathbf{e}}_R R^2\sin\vartheta\mathrm{d}\vartheta\mathrm{d}\varphi + \underline{\mathbf{e}}_\vartheta R\sin\vartheta\mathrm{d}R\mathrm{d}\varphi + \underline{\mathbf{e}}_\varphi R\mathrm{d}R\mathrm{d}\vartheta$
$\mathrm{d}V$	$\mathrm{d}x\ \mathrm{d}y\ \mathrm{d}z$	$r\ \mathrm{d}r\ \mathrm{d}\varphi\ \mathrm{d}z$	$R^2\sin\vartheta\ \mathrm{d}R\ \mathrm{d}\vartheta\ \mathrm{d}\varphi$
$\boldsymbol{\nabla}\Phi$	$\underline{\mathbf{e}}_x\dfrac{\partial\Phi}{\partial x} + \underline{\mathbf{e}}_y\dfrac{\partial\Phi}{\partial y} + \underline{\mathbf{e}}_z\dfrac{\partial\Phi}{\partial z}$	$\underline{\mathbf{e}}_r\dfrac{\partial\Phi}{\partial r} + \underline{\mathbf{e}}_\varphi\dfrac{1}{r}\dfrac{\partial\Phi}{\partial\varphi} + \underline{\mathbf{e}}_z\dfrac{\partial\Phi}{\partial z}$	$\underline{\mathbf{e}}_R\dfrac{\partial\Phi}{\partial R} + \underline{\mathbf{e}}_\vartheta\dfrac{1}{R}\dfrac{\partial\Phi}{\partial\vartheta} + \underline{\mathbf{e}}_\varphi\dfrac{1}{R\sin\vartheta}\dfrac{\partial\Phi}{\partial\varphi}$
$\boldsymbol{\nabla}\cdot\underline{\mathbf{A}}$	$\dfrac{\partial A_x}{\partial x} + \dfrac{\partial A_y}{\partial y} + \dfrac{\partial A_z}{\partial z}$	$\dfrac{1}{r}\dfrac{\partial(rA_r)}{\partial r} + \dfrac{1}{r}\dfrac{\partial A_\varphi}{\partial\varphi} + \dfrac{\partial A_z}{\partial z}$	$\dfrac{1}{R^2}\dfrac{\partial(R^2A_R)}{\partial R} + \dfrac{1}{R\sin\vartheta}\dfrac{\partial(A_\vartheta\sin\vartheta)}{\partial\vartheta} + \dfrac{1}{R\sin\vartheta}\dfrac{\partial A_\varphi}{\partial\varphi}$
$\boldsymbol{\nabla}\times\underline{\mathbf{A}}$	$\left[\dfrac{\partial A_z}{\partial y} - \dfrac{\partial A_y}{\partial z}\right]\underline{\mathbf{e}}_x$ $+\left[\dfrac{\partial A_x}{\partial z} - \dfrac{\partial A_z}{\partial x}\right]\underline{\mathbf{e}}_y$ $+\left[\dfrac{\partial A_y}{\partial x} - \dfrac{\partial A_x}{\partial y}\right]\underline{\mathbf{e}}_z$	$\left[\dfrac{1}{r}\dfrac{\partial A_z}{\partial\varphi} - \dfrac{\partial A_\varphi}{\partial z}\right]\underline{\mathbf{e}}_r$ $+\left[\dfrac{\partial A_r}{\partial z} - \dfrac{\partial A_z}{\partial r}\right]\underline{\mathbf{e}}_\varphi$ $+\dfrac{1}{r}\left[\dfrac{\partial(rA_\varphi)}{\partial r} - \dfrac{\partial A_r}{\partial\varphi}\right]\underline{\mathbf{e}}_z$	$\dfrac{1}{R\sin\vartheta}\left[\dfrac{\partial(A_\varphi\sin\vartheta)}{\partial\vartheta} - \dfrac{\partial A_\vartheta}{\partial\varphi}\right]\underline{\mathbf{e}}_R$ $+\dfrac{1}{R}\left[\dfrac{1}{\sin\vartheta}\dfrac{\partial A_R}{\partial\varphi} - \dfrac{\partial(RA_\varphi)}{\partial R}\right]\underline{\mathbf{e}}_\vartheta$ $+\dfrac{1}{R}\left[\dfrac{\partial(RA_\vartheta)}{\partial R} - \dfrac{\partial A_R}{\partial\vartheta}\right]\underline{\mathbf{e}}_\varphi$
$\boldsymbol{\nabla}\cdot\boldsymbol{\nabla}\Phi = \Delta\Phi$	$\dfrac{\partial^2\Phi}{\partial x^2} + \dfrac{\partial^2\Phi}{\partial y^2} + \dfrac{\partial^2\Phi}{\partial z^2}$	$\dfrac{1}{r}\dfrac{\partial}{\partial r}\left(r\dfrac{\partial\Phi}{\partial r}\right) + \dfrac{1}{r^2}\dfrac{\partial^2\Phi}{\partial\varphi^2} + \dfrac{\partial^2\Phi}{\partial z^2}$	$\dfrac{1}{R^2}\dfrac{\partial}{\partial R}\left(R^2\dfrac{\partial\Phi}{\partial R}\right) + \dfrac{1}{R\sin\vartheta}\dfrac{\partial}{\partial\vartheta}\left(\sin\vartheta\dfrac{\partial\Phi}{\partial\vartheta}\right) + \dfrac{1}{R^2\sin^2\vartheta}\dfrac{\partial^2\Phi}{\partial\varphi^2}$
$\boldsymbol{\nabla}\cdot\boldsymbol{\nabla}\underline{\mathbf{A}} = \Delta\underline{\mathbf{A}}$	$\Delta A_x\underline{\mathbf{e}}_x + \Delta A_y\underline{\mathbf{e}}_y + \Delta A_z\underline{\mathbf{e}}_z$	$\left[\Delta A_r - \dfrac{A_r}{r^2} - \dfrac{2}{r^2}\dfrac{\partial A_\varphi}{\partial\varphi}\right]\underline{\mathbf{e}}_r$ $+\left[\Delta A_\varphi - \dfrac{A_\varphi}{r^2} + \dfrac{2}{r^2}\dfrac{\partial A_r}{\partial\varphi}\right]\underline{\mathbf{e}}_\varphi$ $+\Delta A_z\underline{\mathbf{e}}_z$	$\left[\Delta A_R - \dfrac{2A_R}{R^2} - \dfrac{2A_\vartheta\cot\vartheta}{R^2} - \dfrac{2}{R^2}\dfrac{\partial A_\vartheta}{\partial\vartheta} - \dfrac{2}{R^2\sin\vartheta}\dfrac{\partial A_\varphi}{\partial\varphi}\right]\underline{\mathbf{e}}_R$ $+\left[\Delta A_\vartheta + \dfrac{2}{R^2}\dfrac{\partial A_R}{\partial\vartheta} - \dfrac{A_\vartheta}{R^2\sin^2\vartheta} - \dfrac{2\cos\vartheta}{R^2\sin^2\vartheta}\dfrac{\partial A_\varphi}{\partial\varphi}\right]\underline{\mathbf{e}}_\vartheta$ $+\left[\Delta A_\varphi + \dfrac{2}{R^2\sin\vartheta}\dfrac{\partial A_R}{\partial\varphi} - \dfrac{A_\varphi}{R^2\sin^2\vartheta} + \dfrac{2\cos\vartheta}{R^2\sin^2\vartheta}\dfrac{\partial A_\varphi}{\partial\varphi}\right]\underline{\mathbf{e}}_\varphi$