Tabelle 1: Darstellung des Ortsvektors, der Tangenteneinheitsvektoren und Lamè-Koeffizienten in den gebräuchlichen orthogonalen Koordinatensystemen

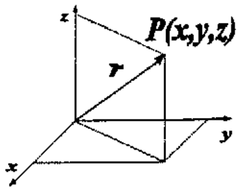
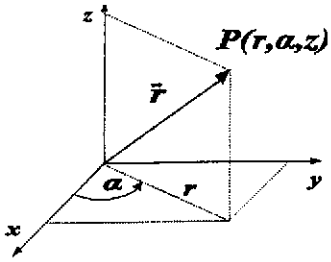
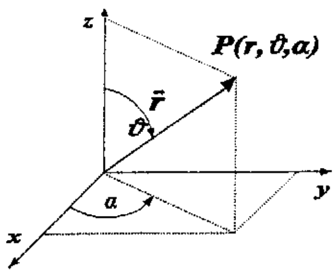
	kartesisch	zylindrisch	sphärisch
$\boldsymbol{r}$	$\boldsymbol{r} = x\,\boldsymbol{e}_x$ $+ y\,\boldsymbol{e}_y$ $+ z\,\boldsymbol{e}_z$	$\boldsymbol{r} = r\cos\alpha\,\boldsymbol{e}_x$ $+ r\sin\alpha\,\boldsymbol{e}_y$ $+ z\,\boldsymbol{e}_z$	$\boldsymbol{r} = r\cos\alpha\sin\vartheta\,\boldsymbol{e}_x$ $+ r\sin\alpha\sin\vartheta\,\boldsymbol{e}_y$ $+ r\cos\vartheta\,\boldsymbol{e}_z$
			
$\dfrac{\partial \boldsymbol{r}}{\partial x_i}$	$\dfrac{\partial \boldsymbol{r}}{\partial x} = \boldsymbol{e}_x$ $\dfrac{\partial \boldsymbol{r}}{\partial y} = \boldsymbol{e}_y$ $\dfrac{\partial \boldsymbol{r}}{\partial z} = \boldsymbol{e}_z$	$\dfrac{\partial \boldsymbol{r}}{\partial r} = \cos\alpha\,\boldsymbol{e}_x$ $+ \sin\alpha\,\boldsymbol{e}_y$ $\dfrac{\partial \boldsymbol{r}}{\partial \alpha} = -r\sin\alpha\,\boldsymbol{e}_x$ $+ r\cos\alpha\,\boldsymbol{e}_y$ $\dfrac{\partial \boldsymbol{r}}{\partial z} = \boldsymbol{e}_z$	$\dfrac{\partial \boldsymbol{r}}{\partial r} = \cos\alpha\sin\vartheta\,\boldsymbol{e}_x$ $+ \sin\alpha\sin\vartheta\,\boldsymbol{e}_y$ $+ \cos\vartheta\,\boldsymbol{e}_z$ $\dfrac{\partial \boldsymbol{r}}{\partial \vartheta} = r\cos\alpha\cos\vartheta\,\boldsymbol{e}_x$ $+ r\sin\alpha\cos\vartheta\,\boldsymbol{e}_y$ $- r\sin\vartheta\,\boldsymbol{e}_z$ $\dfrac{\partial \boldsymbol{r}}{\partial \alpha} = - r\sin\alpha\sin\vartheta\,\boldsymbol{e}_x$ $+ r\cos\alpha\sin\vartheta\,\boldsymbol{e}_y$
h_i	$h_1 = h_x = 1$ $h_2 = h_y = 1$ $h_3 = h_z = 1$	$h_1 = h_r = 1$ $h_2 = h_\alpha = r$ $h_3 = h_z = 1$	$h_1 = h_r = 1$ $h_2 = h_\vartheta = r$ $h_3 = h_\alpha = r\sin\vartheta$
$\boldsymbol{e}_i$	$\boldsymbol{e}_1 = \boldsymbol{e}_x$ $\boldsymbol{e}_2 = \boldsymbol{e}_y$ $\boldsymbol{e}_3 = \boldsymbol{e}_z$	$\boldsymbol{e}_1 = \boldsymbol{e}_r = +\cos\alpha\,\boldsymbol{e}_x$ $+ \sin\alpha\,\boldsymbol{e}_y$ $\boldsymbol{e}_2 = \boldsymbol{e}_\alpha = -\sin\alpha\,\boldsymbol{e}_x$ $+ \cos\alpha\,\boldsymbol{e}_y$ $\boldsymbol{e}_3 = \boldsymbol{e}_z = \boldsymbol{e}_z$	$\boldsymbol{e}_1 = \boldsymbol{e}_r = \dfrac{\partial \boldsymbol{r}}{\partial r}$ $\boldsymbol{e}_2 = \boldsymbol{e}_\vartheta = \dfrac{1}{r}\dfrac{\partial \boldsymbol{r}}{\partial \vartheta}$ $\boldsymbol{e}_3 = \boldsymbol{e}_\alpha = \dfrac{1}{r\sin\vartheta}\dfrac{\partial \boldsymbol{r}}{\partial \alpha}$

Tabelle 2: Die Differentialoperatoren in allgemeinen Koordinaten

	Definition	Darstellung in allgemeinen, krummlinigen Koordinaten
grad φ (∇φ)	$grad\,\varphi = \lim\limits_{\Delta V \to 0} \dfrac{\oint_{\Delta A} \varphi\, dA}{\Delta V}$	$grad\,\varphi = \sum\limits_{i=1}^{3} e_i \dfrac{1}{h_i}\dfrac{\partial \varphi}{\partial x_i}$
div v (∇·v)	$div\,v = \lim\limits_{\Delta V \to 0} \dfrac{\oint_{\Delta A} v \cdot dA}{\Delta V}$	$div\,v = \dfrac{1}{h}\sum\limits_{i=1}^{3} \dfrac{\partial}{\partial x_i}\left(\dfrac{h}{h_i} e_i \cdot v\right)$
rot v (∇ × v)	$rot\,v = lim_{\Delta V \to 0} \dfrac{\oint_{\Delta A} dA \times v}{\Delta V}$	$rot\,v = \dfrac{1}{h}\sum\limits_{i=1}^{3} \dfrac{\partial}{\partial x_i}\left(\dfrac{h}{h_i} e_i \times v\right)$ $= \dfrac{1}{h}\begin{vmatrix} e_1 h_1 & e_2 h_2 & e_3 h_3 \\ \dfrac{\partial}{\partial x_1} & \dfrac{\partial}{\partial x_2} & \dfrac{\partial}{\partial x_3} \\ v_1 h_1 & v_2 h_2 & v_3 h_3 \end{vmatrix}$
Δφ ($\nabla^2\varphi$)	div grad φ	$\Delta\varphi = \dfrac{1}{h}\sum\limits_{i=1}^{3} \dfrac{\partial}{\partial x_i}\left(\dfrac{h}{h_i^2}\dfrac{\partial \varphi}{\partial x_i}\right)$
Δv	grad div **v** - rot rot **v** $= \nabla(\nabla \cdot v) - \nabla \times (\nabla \times v)$	siehe z.B.: *Wunsch/Schulz: Elektromagnetische Felder. Verlag Technik, Berlin, 1989, S. 89*

Tabelle 3: Die Differentialoperatoren in den gebräuchlichsten orthogonalen Koordinatensystemen

	kartesisch	zylindrisch	sphärisch
grad φ ($\nabla\varphi$)	$= \frac{\partial\varphi}{\partial x}\boldsymbol{e}_x + \frac{\partial\varphi}{\partial y}\boldsymbol{e}_y + \frac{\partial\varphi}{\partial z}\boldsymbol{e}_z$	$= \frac{\partial\varphi}{\partial r}\boldsymbol{e}_r + \frac{1}{r}\frac{\partial\varphi}{\partial\alpha}\boldsymbol{e}_\alpha + \frac{\partial\varphi}{\partial z}\boldsymbol{e}_z$	$= \frac{\partial\varphi}{\partial r}\boldsymbol{e}_r + \frac{1}{r}\frac{\partial\varphi}{\partial\vartheta}\boldsymbol{e}_\vartheta + \frac{1}{r\sin\vartheta}\frac{\partial\varphi}{\partial\alpha}\boldsymbol{e}_\alpha$
div **v** ($\nabla\cdot\mathbf{v}$)	$= \frac{\partial v_x}{\partial x} + \frac{\partial v_y}{\partial y} + \frac{\partial v_z}{\partial z}$	$= \frac{1}{r}\frac{\partial(r\cdot v_r)}{\partial r} + \frac{1}{r}\frac{\partial v_\alpha}{\partial\alpha} + \frac{\partial v_z}{\partial z}$	$= \frac{1}{r^2}\frac{\partial(r^2\cdot v_r)}{\partial r} + \frac{1}{r\sin\vartheta}\frac{\partial(\sin\vartheta\cdot v_\vartheta)}{\partial\vartheta} + \frac{1}{r\sin\vartheta}\frac{\partial v_\alpha}{\partial\alpha}$
rot **v** ($\nabla\times\mathbf{v}$)	$= \left(\frac{\partial v_z}{\partial y} - \frac{\partial v_y}{\partial z}\right)\boldsymbol{e}_x + \left(\frac{\partial v_x}{\partial z} - \frac{\partial v_z}{\partial x}\right)\boldsymbol{e}_y + \left(\frac{\partial v_y}{\partial x} - \frac{\partial v_x}{\partial y}\right)\boldsymbol{e}_z$	$= \left(\frac{1}{r}\frac{\partial v_z}{\partial\alpha} - \frac{\partial v_\alpha}{\partial z}\right)\boldsymbol{e}_r + \left(\frac{\partial v_r}{\partial z} - \frac{\partial v_z}{\partial r}\right)\boldsymbol{e}_\alpha + \frac{1}{r}\left(\frac{\partial(r v_\alpha)}{\partial r} - \frac{\partial v_r}{\partial\alpha}\right)\boldsymbol{e}_z$	$= \frac{1}{r\sin\vartheta}\left(\frac{\partial(v_\alpha\sin\vartheta)}{\partial\vartheta} - \frac{\partial v_\vartheta}{\partial\alpha}\right)\boldsymbol{e}_r + \frac{1}{r}\left(\frac{1}{\sin\vartheta}\frac{\partial v_r}{\partial\alpha} - \frac{\partial(r v_\alpha)}{\partial r}\right)\boldsymbol{e}_\vartheta + \frac{1}{r}\left(\frac{\partial(r v_\vartheta)}{\partial r} - \frac{\partial v_r}{\partial\vartheta}\right)\boldsymbol{e}_\alpha$
Δφ ($\nabla^2\varphi$)	$= \frac{\partial^2\varphi}{\partial x^2} + \frac{\partial^2\varphi}{\partial y^2} + \frac{\partial^2\varphi}{\partial z^2}$	$= \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial\varphi}{\partial r}\right) + \frac{1}{r^2}\frac{\partial^2\varphi}{\partial\alpha^2} + \frac{\partial^2\varphi}{\partial z^2}$	$= \frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial\varphi}{\partial r}\right) + \frac{1}{r^2\sin\vartheta}\frac{\partial}{\partial\vartheta}\left(\sin\vartheta\frac{\partial\varphi}{\partial\vartheta}\right) + \frac{1}{r^2\sin^2\vartheta}\frac{\partial^2\varphi}{\partial\alpha^2}$
Δ v	$= \Delta v_x\boldsymbol{e}_x + \Delta v_y\boldsymbol{e}_y + \Delta v_z\boldsymbol{e}_z$	……	……

Tabelle 4: Rechenregeln der Vektoranalysis und Integralsätze

Zusammengesetzte Ausdrücke	Integralsätze
$\mathrm{grad}\,(\varphi+\psi) = \mathrm{grad}\,\varphi + \mathrm{grad}\,\psi$ $\mathrm{grad}\,(\varphi\cdot\psi) = \varphi\,\mathrm{grad}\,\psi + \psi\,\mathrm{grad}\,\varphi$ $\mathrm{grad}\,(\mathbf{A}\cdot\mathbf{B}) = (\mathbf{A}\cdot\nabla)\,\mathbf{B} + (\mathbf{B}\cdot\nabla)\,\mathbf{A} + \mathbf{A}\times\mathrm{rot}\,\mathbf{B} + \mathbf{B}\times\mathrm{rot}\,\mathbf{A}$ $\mathrm{div}\,(\mathbf{A}+\mathbf{B}) = \mathrm{div}\,\mathbf{A} + \mathrm{div}\,\mathbf{B}$ $\mathrm{div}\,(\varphi\cdot\mathbf{A}) = \varphi\cdot\mathrm{div}\,\mathbf{A} + \mathbf{A}\cdot\mathrm{grad}\,\varphi$ $\mathrm{div}\,(\mathbf{A}\times\mathbf{B}) = \mathbf{B}\cdot\mathrm{rot}\,\mathbf{A} - \mathbf{A}\cdot\mathrm{rot}\,\mathbf{B}$ $\mathrm{rot}\,(\mathbf{A}+\mathbf{B}) = \mathrm{rot}\,\mathbf{A} + \mathrm{rot}\,\mathbf{B}$ $\mathrm{rot}\,(\varphi\cdot\mathbf{A}) = \varphi\cdot\mathrm{rot}\,\mathbf{A} + \mathrm{grad}\,\varphi\times\mathbf{A}$ $\mathrm{rot}\,(\mathbf{A}\times\mathbf{B}) = \mathbf{A}\cdot\mathrm{div}\,\mathbf{B} - \mathbf{B}\cdot\mathrm{div}\,\mathbf{A} + (\mathbf{B}\cdot\nabla)\,\mathbf{A} - (\mathbf{A}\cdot\nabla)\,\mathbf{B}$ $\mathrm{rot}\,\mathrm{rot}\,\mathbf{A} = \mathrm{grad}\,\mathrm{div}\,\mathbf{A} - \nabla^2\mathbf{A}$ $\mathrm{div}\,\mathrm{grad}\,\varphi = \nabla^2\varphi = \Delta\varphi$ $\mathrm{rot}\,\mathrm{grad}\,\varphi = 0$ $\mathrm{div}\,\mathrm{rot}\,\mathbf{A} = 0$	**Satz von Gauß** $\int_V div\boldsymbol{B}\,dV = \oint_A \boldsymbol{B}\cdot d\boldsymbol{A}$ **Satz von Stokes** $\int_A rot\boldsymbol{B}\cdot d\boldsymbol{A} = \oint_C \boldsymbol{B}\cdot d\boldsymbol{s}$ **Greensche Sätze** **1. Satz:** $\oint_A (\varphi\cdot grad\psi)\cdot d\boldsymbol{A} = \int_V div(\varphi\cdot grad\psi)\,dV = \int_V \varphi\nabla^2\psi\,dV + \int_V grad\varphi\cdot grad\psi\,dV$ **2. Satz:** $\int_V (\varphi\nabla^2\psi - \psi\nabla^2\varphi)\,dV = \oint_A (\varphi\,grad\psi - \psi\,grad\varphi)\cdot d\boldsymbol{A}$
$\mu_0 = 4\pi\cdot 10^{-7}$ Vs/Am $\varepsilon_0 = 8.86\cdot 10^{-12}$ As/Vm	