Integralsätze

- Greenscher Integralsatz der Ebene

$$\oint\limits_{(F)} \left(A^1\left(x^1,x^2\right)dx^1 + A^2\left(x^1,x^2\right)dx^2\right) = \iint\limits_{F} \left(\partial_{x^1}A^2 - \partial_{x^2}A^1\right)dx^1dx^2$$

- Stokesscher Integralsatz

$$\oint\limits_{(O)} \underline{A}\cdot d\underline{r} = \iint\limits_{O} \mathrm{rot}\underline{A}\cdot d\underline{O}$$

- Gaußscher Integralsatz

$$\iint\limits_{(V)} \underline{A}\cdot d\underline{O} = \iiint\limits_{V} \mathrm{div}\underline{A}\,dV$$

- Erste Greensche Integralformel

$$\iint\limits_{(V)} \Phi\,\mathrm{grad}\Psi\,d\underline{O} = \iiint\limits_{V} \Phi\Delta\Psi\,dV + \iiint\limits_{V} \mathrm{grad}\Phi\,\mathrm{grad}\Psi\,dV$$

- Zweite Greensche Integralformel

$$\iint\limits_{(V)} \left(\Phi\,\mathrm{grad}\Psi - \Psi\,\mathrm{grad}\Phi\right)d\underline{O} = \iiint\limits_{V} \left(\Phi\Delta\Psi - \Psi\Delta\Phi\right)\,dV$$

- Differentiale

$$\begin{aligned} d\underline{r} &= dx^a\underline{e}_a \\ d\underline{O} &= \left(\partial_u\underline{r}\times\partial_v\underline{r}\right)dudv \\ dV &= dx^1dx^2dx^3 \end{aligned}$$