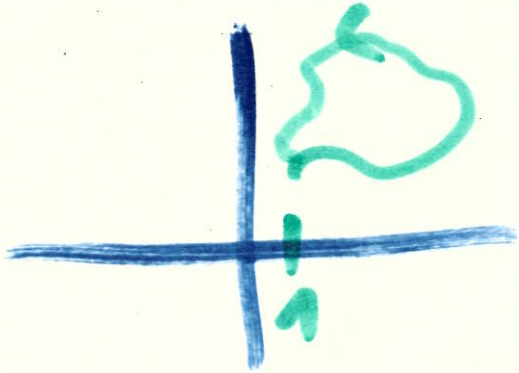
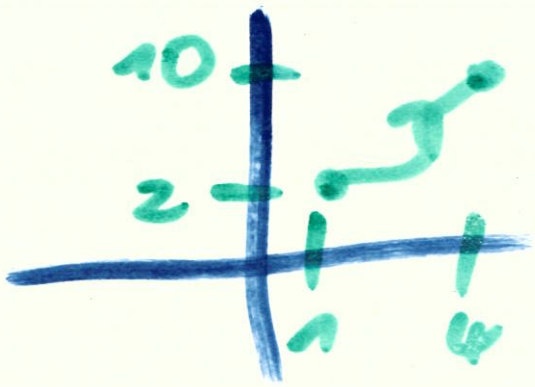
Differentialformen

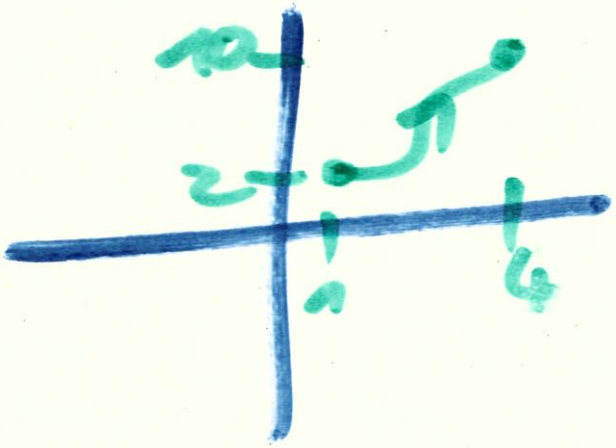
Differentialform	Gebiet	Auswertung
dx		3
dx		0

dy



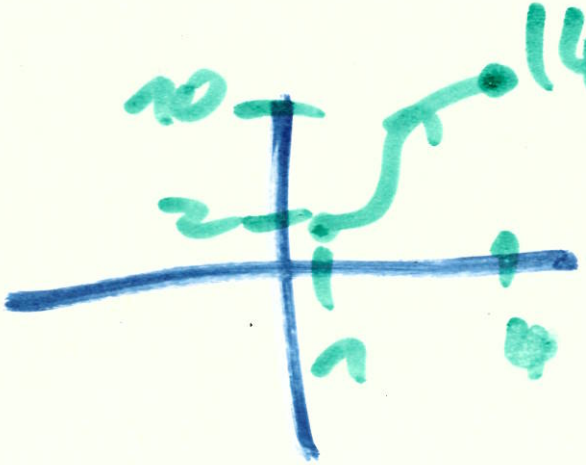
8

$dx+dy$



$3+8=11$

$dx+3dy$



$3+3\cdot8=2$

dx

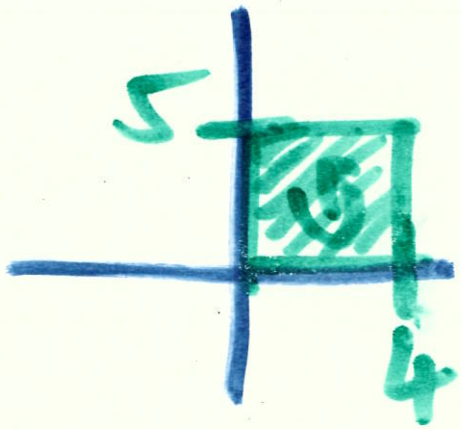
-3

das wäre
1-Form

ab hier:
2-Form

$dx \wedge dy = dx\,dy$

↑ Wedge-Produkt
Dachprodukt

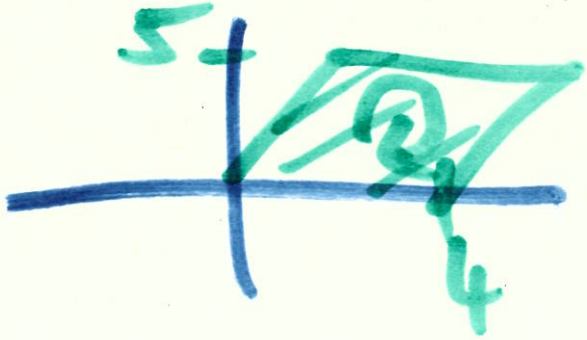


20

$dx \wedge dy$

20

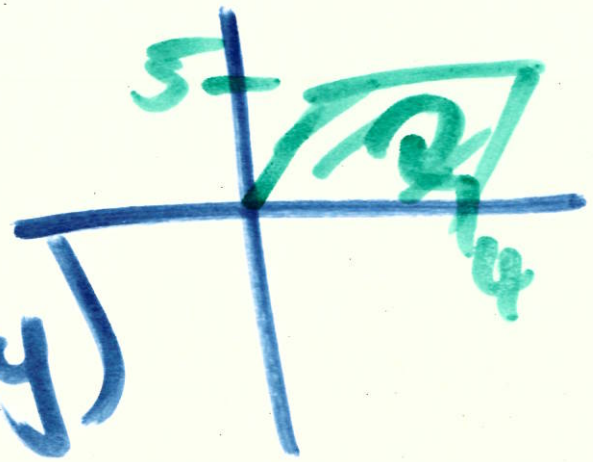
$dx \wedge dy$



-20

$dy \wedge dx$

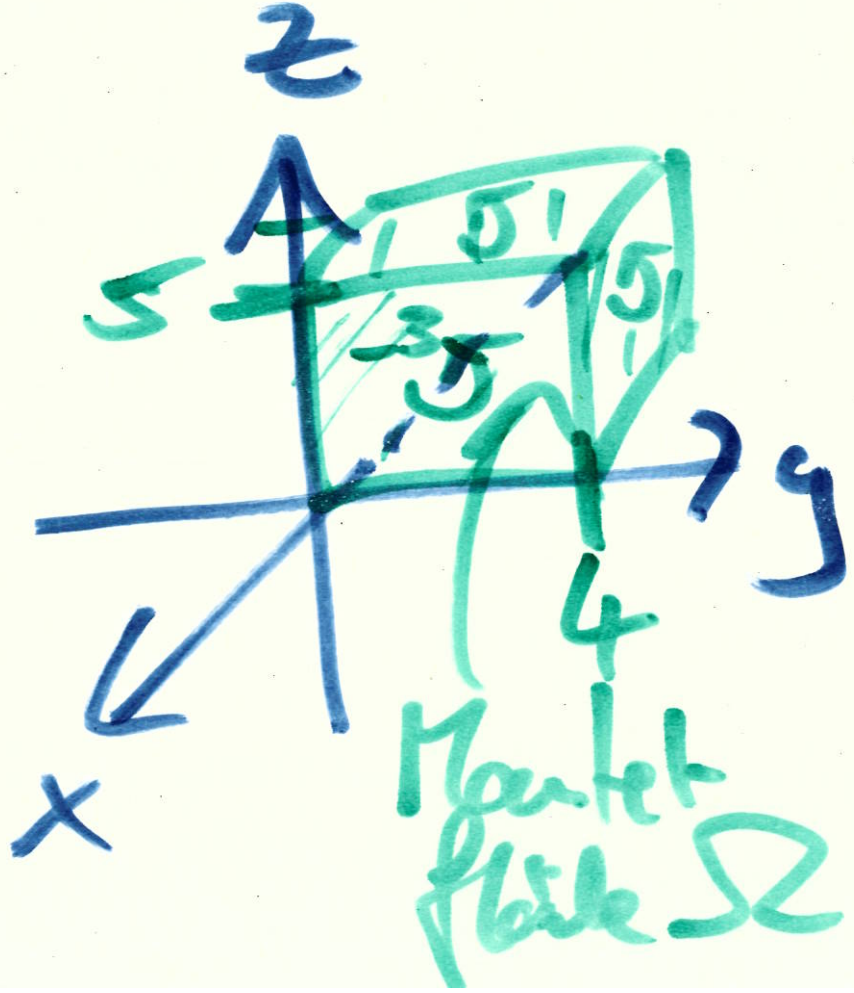
$= -(dx \wedge dy)$



$+20$ ⑤

$\omega =$

$dx \wedge dy$



$0+0$

$+0+0$

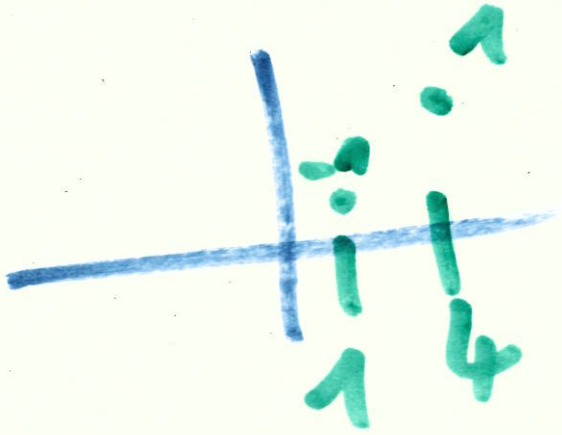
$+12+(-12)$

oben

$=0$

Bsp. Ableitung der 0-Formen.

$\sqrt{4} = 2$



$\sqrt{4-\sqrt{1}}$

$= 2-1$

$= 1$

$\int \sqrt{x}$

$dx \wedge dy \wedge dz$

↑ eine 3-Form !

$\frac{4}{3}\pi \cdot 5^3$ (2)

↑ mit dem Innern

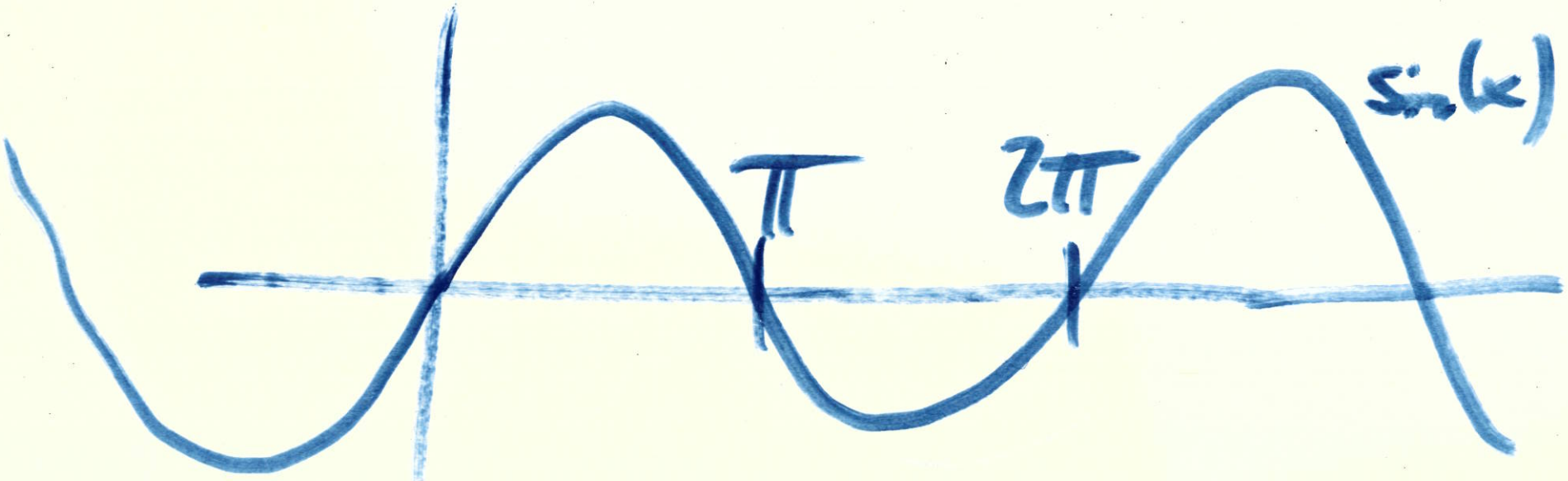
$$\int_{\Omega} \omega := \text{Auswertung von } \omega \text{ an } \Omega$$

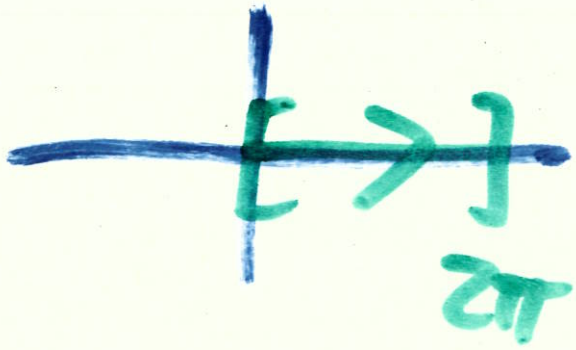
ω ∈ n-Form

Ω: n-dim. Gebilde

$$\int_a^b \sin(x)\,dx = \int \sin(x)\,dx$$

$$\int_a^b$$



$\sin(x)\,dx$  0

$3dx$ — " — $3 \cdot 2\pi$

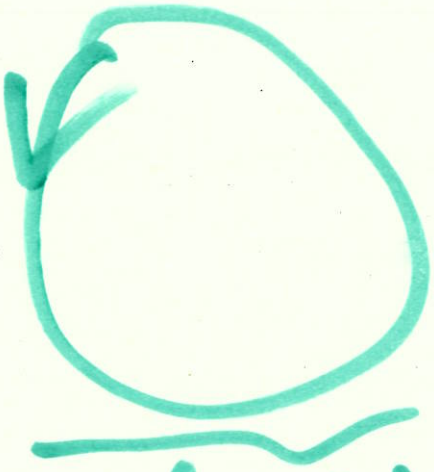
Satz von Stokes

die Mutter aller Integrationssätze

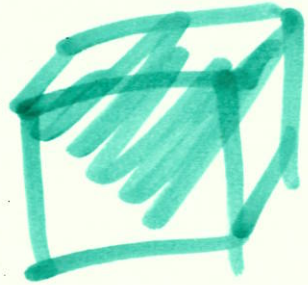
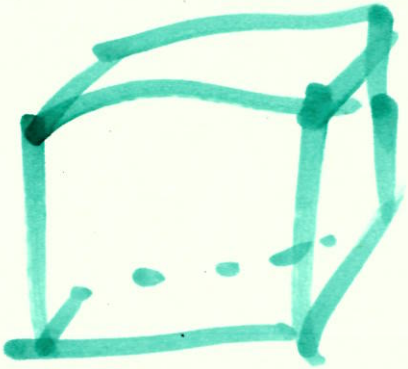
$$\int_{\Omega} d\omega = \int_{\partial\Omega} \omega$$

d der exterior Ableitungsoperator

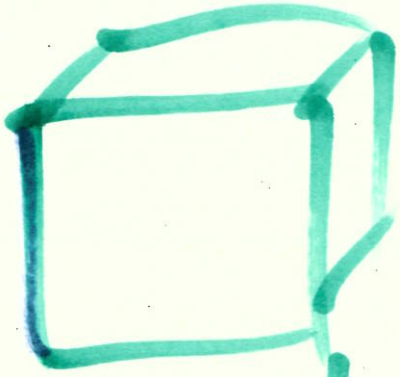
∂ Rand

∂  $=$ 

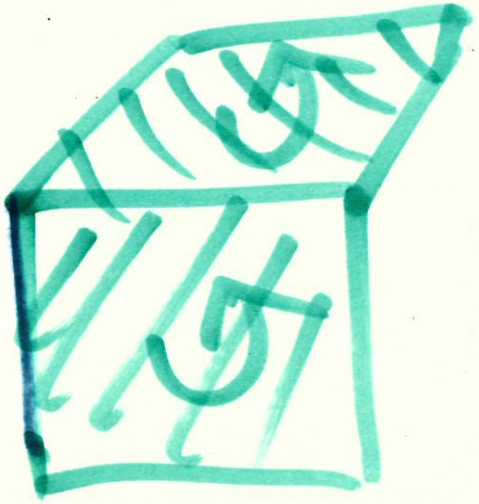
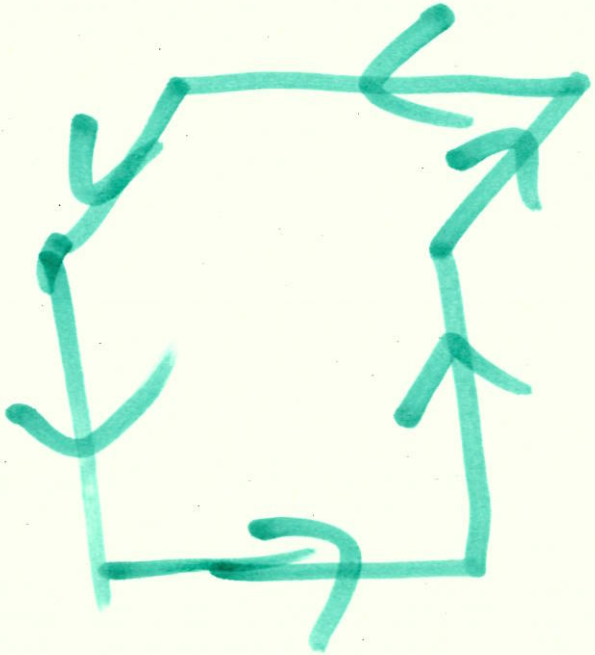
2-dim. S — 1-dim. Gebiet

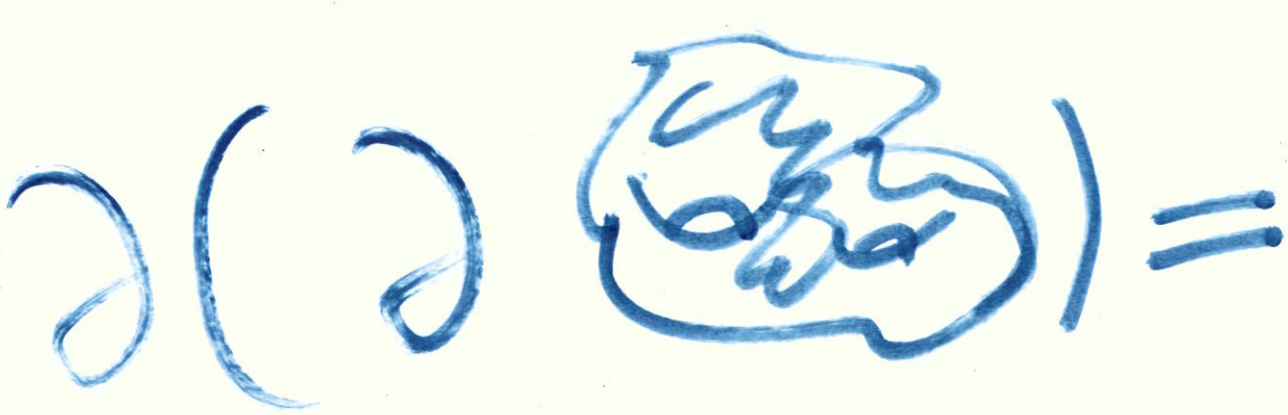
∂  $=$ 

rausgefüllter Quader — Mantelfläche

∂  $= \emptyset$

Hohl-
kugel

∂  $=$ 



$$d(\omega + \tau) = d\omega + d\tau$$

$$d(\omega \wedge \tau) = (d\omega) \wedge \tau + (-1)^n \omega \wedge d\tau$$

wenn ω eine n-Form ist

$$d(d\omega) = 0$$

Pss: $d(x^2) = d(x \cdot x)$

$= d(x \wedge x) = (dx) \wedge x + x \wedge dx$

$= x\,dx + x\,dx = \underline{\underline{2x\,dx}}$

$d(f(x)) = f'(x)\,dx$

Bsp: $d(x^3) = d(x^2 \wedge x)$

$$= \underbrace{d(x^2)}_{=2x\,dx} \wedge x + x^2 \wedge dx$$

$$= 2x^2\,dx + x^2\,dx = \underline{\underline{3x^2\,dx}}$$

Bsp: $d(e^x) = e^x \, dx$

$d(-\cos(x)) = \sin(x) \, dx$

HDI: $\int_a^b f'(x)\,dx = f(b) - f(a)$

Bsp:

$$\int_1^7 3x^2\,dx = 7^3 - 1^3$$

Stokes sagt:

$$\int_{\partial\Omega} \omega = \int_{\Omega} d\omega$$

$$\int_a^b f'(x)\,dx = \int_{-1}^{1} g(x) = f(b) - f(a)$$

$$\int_{\partial\Omega} \omega = \int_{\Omega} d(f(x))$$