Big idea: Generalized Stoke's Thm (exterior derivative d)
(differential form ω)

exterior derivative

$$\int_R d\omega = \int_{\partial R} \omega.$$

boundary

Compare with Fundamental Theorem of Calculus:

$$\underbrace{\int_a^b F'(t)\,dt}_{} = \underbrace{F(b) - F(a)}_{\text{0-dim'l integral over bdry}}$$

dF

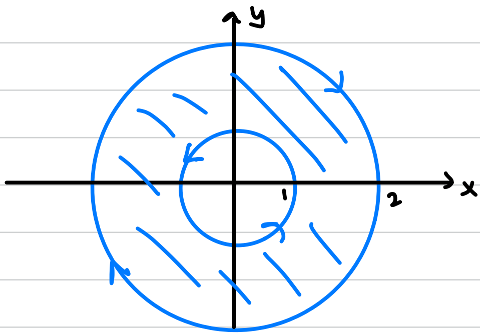
$$\int_{[a,b]} F' = \int_{\text{bdry}} F.$$

$F = \omega$

$[a,b] = R$

deriv. = exterior deriv.

Ex Find $\oint_C xy^3\,dx + yx^3\,dy$ where C is the boundary of the region:



$$\vec{F} = (\underbrace{xy^3}_{M}, \underbrace{yx^3}_{N})$$

with negative orientation relative to D.

b/c of neg orientation

$$-\iint_D \underbrace{3x^2y}_{\partial N/\partial x} - \underbrace{3xy^2}_{\partial M/\partial y}\,dA$$

(at this stage, done w/ Greens... now just compute)

polar conversion

$$-\int_0^{2\pi}\int_1^2 \left[3(r\cos\theta)^2(r\sin\theta) - 3(r\cos\theta)(r\sin\theta)^2\right] r\,dr\,d\theta.$$

* distortion!

$= \text{etc.}$