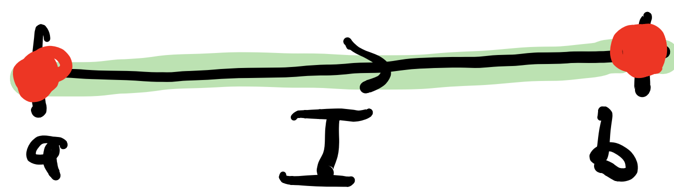
Integral theorems

1D

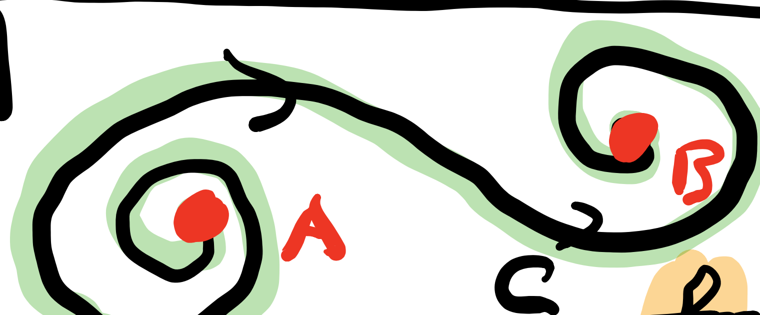
f — $\frac{d}{dx} f = f'$
$= df$



$\partial I = \{a, b\}$ boundary

$$\int_I df = f(b) - f(a) = \int_{\partial I} f$$

2D



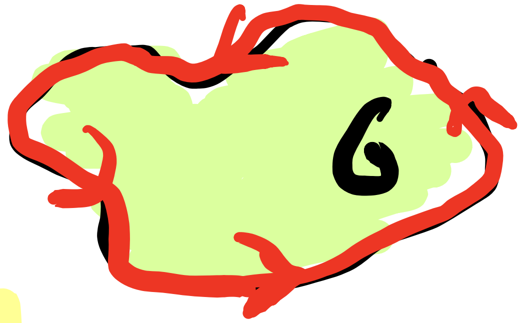
f

f scalar field

FTLI

$$df = \nabla f = \text{grad}\, f$$

$$\int_C df = f(B) - f(A) = \int_{\partial C} f$$



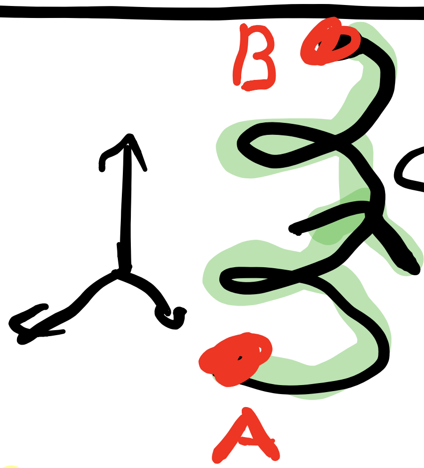
$\vec{F} = [P, Q]$

field

$dF = \mathrm{curl}(F)$

Green $$\iint_G dF = \int_{\partial G} F$$

$\boxed{3D}$

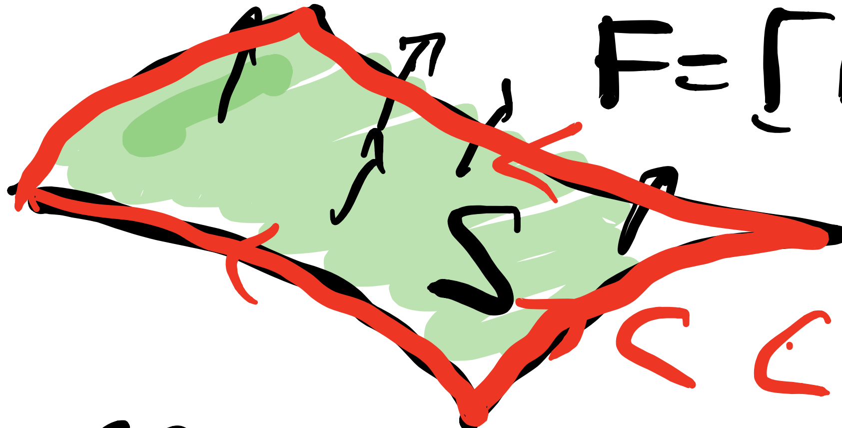


f scalar function

$df = [f_x, f_y, f_z]$

$= \mathrm{grad}\, f$

FTLI $$\int_C df = \int_{\partial C} f = f(B) - f(A)$$



$F = [P, Q, R]$

$dF = \operatorname{curl}(F)$

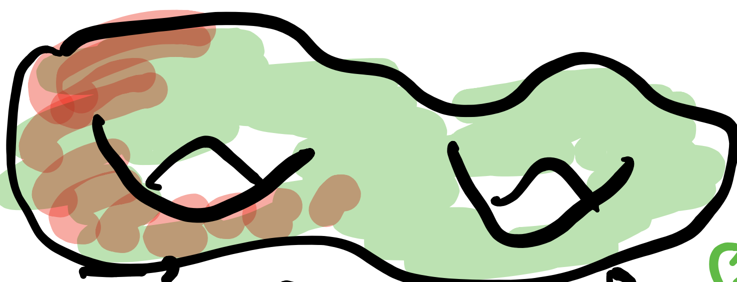
$C \quad C = \partial S$

$$\iint_S dF = \int_{\partial S} F$$

Stokes

S

∂E



E

solid

$F = [P, Q, R]$

$dF = \operatorname{div} F$

$$\iiint_E dF = \iint_{\partial E} F$$

diverg. theorem

All of these theorems are of the form

Stokes

$$\boxed{\int_{G} dF = \int_{\partial G} F}$$

" "

F "field"

G "geometry"

---

d derivative

∂ boundary

$d \circ d = 0$

$\partial \circ \partial = 0$

curl grad f = 0

div curl F = 0

$$\partial(\partial S) = \emptyset$$

curve

cra.

$$\partial \circ \partial S = \emptyset$$

surface