Triple Integrals (7A)

- Triple Integral
- Triple Integrals in Polar Coordinates

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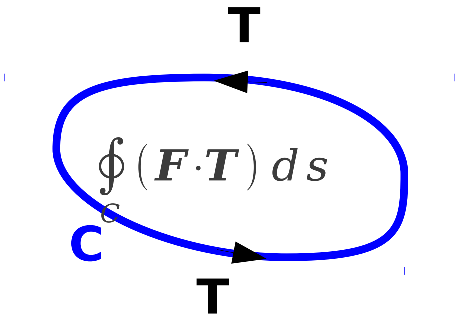
Area and Volume

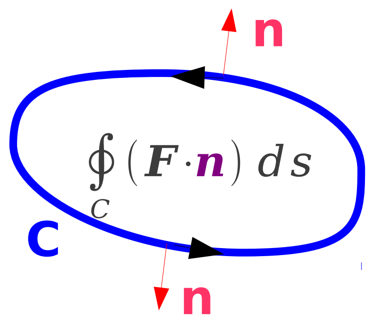
$$A = \iint_R dA$$

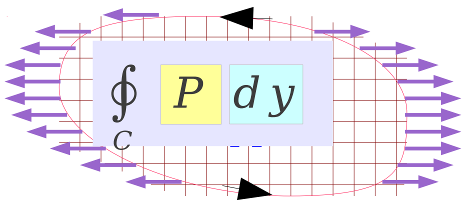
$$V = \iint_R f(x, y)\, dA$$

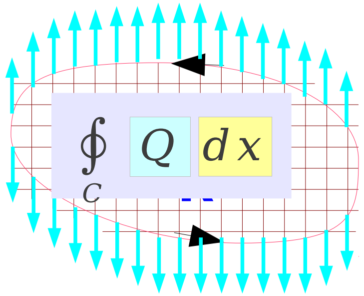
Vector Form of Green's Theorem – Div

C: a piecewise simple closed curve bounding by a simply connected region **R**









Line Integral | **Double Integral**

$$\oint_C (\boldsymbol{F}\cdot\boldsymbol{T})\, ds = \oint_C P\, dx + Q\, dy = \iint_R \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right) dA = \iint_R (curl\ \boldsymbol{F})\cdot\boldsymbol{k}\, dA$$

$$\oint_C (\boldsymbol{F}\cdot\boldsymbol{n})\, ds = \oint_C P\, dy - Q\, dx = \iint_R \left(\frac{\partial P}{\partial x} + \frac{\partial Q}{\partial y}\right) dA = \iint_R (div\ \boldsymbol{F})\, dA$$

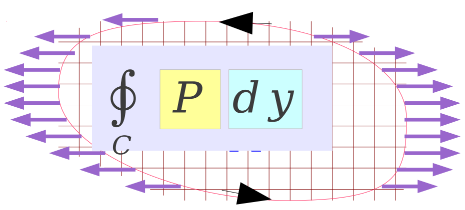
Divergence Theorem

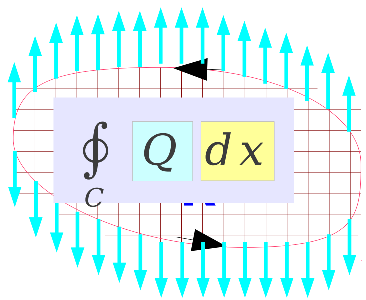
C: a piecewise simple closed curve

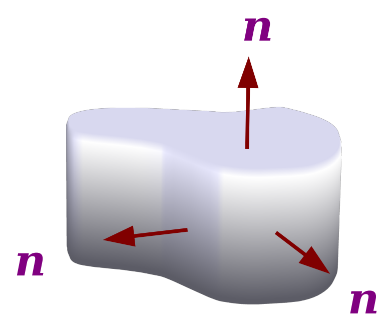
a simply connected region **R**

D: a closed, bounded region

with a piecewise smooth boundary **S**







Line Integral

Double Integral

$$\oint_C (\boldsymbol{F} \cdot \boldsymbol{n}) \, ds = \iint_R \left(\frac{\partial P}{\partial x} + \frac{\partial Q}{\partial y} \right) dA = \iint_R (\mathrm{div} \; \boldsymbol{F}) \, dA$$

Surface Integral

Triple Integral

$$\iint_S (\boldsymbol{F} \cdot \boldsymbol{n}) \, dS = \iiint_D \left(\frac{\partial P}{\partial x} + \frac{\partial Q}{\partial y} + \frac{\partial R}{\partial z} \right) dV = \iiint_D (\mathrm{div} \; \boldsymbol{F}) \, dS$$

References

[1] http://en.wikipedia.org/
[2] http://planetmath.org/
[3] M.L. Boas, “Mathematical Methods in the Physical Sciences”
[4] D.G. Zill, “Advanced Engineering Mathematics”