Surface Integrals

Analog of line integral

line integral: $\int_C \vec{F} \cdot d\vec{r} = \int_{t=a}^{b} \vec{F} \cdot \frac{d\vec{r}}{dt}\, dt$

Surface Integral: $\iint_S \vec{F} \cdot d\vec{S} = \int_{V=a}^{b} \int_{U=c}^{d} F(u,v) \cdot (r_u \times r_v)\, du\, dv$

} $\vec{F}$ is a vector

line integral $\int_C f\, dr = \int_{t=a}^{b} f \left| \frac{dr}{ds} \right| ds$

Surface Integral: $\iint_S f\, dS = \int_{V=a}^{b} \int_{U=c}^{d} f(u,v)\, |r_u \times r_v|\, du\, dv$

} f is a scalar