$$\int_C f\,ds = \int_a^b f(r(t)) \left\| \frac{d\vec{r}}{dt} \right\| dt$$

$$\iint_\Sigma f\,ds = \iint_R f(r(x,y)) \|r_x \times r_y\|\,dA$$

$$\int_C \vec{F}\cdot d\vec{r} = \begin{cases} \int_a^b \vec{F}(r(t)) \cdot \frac{d\vec{r}}{dt} dt & \text{(parametric form)} \\ f(\text{end point}) - f(\text{start point}) & \text{if } \vec{F} = \nabla f \quad (\text{curl}\,\vec{F} = 0) \quad \text{(FTLI)} \\ \pm \iint_R (N_x - M_y)\; dA & \text{if } C \text{ is closed, } \vec{F} = \begin{bmatrix} M \\ N \end{bmatrix} \quad \text{(Green's Theorem)} \\ \pm \iint_\Sigma (\text{curl}(\vec{F})) \cdot \vec{n}\,dS & \text{if } C \text{ is closed, } \vec{F} = \begin{bmatrix} M \\ N \\ P \end{bmatrix} \quad \text{(Stokes' Theorem)} \end{cases}$$

$$\int_\Sigma \vec{F} \cdot \vec{n}\,dS = \begin{cases} \pm \iint_R \vec{F}(r(x,y)) \cdot (r_x \times r_y)\,dA & \text{(surface integral)} \\ \iiint (\text{div}(F))\,dV & \text{(Divergence Theorem)} \end{cases}$$