Change of Variables Formulas

Double integrals:

$$\iint_D f\,dA = \iint_D f(x,y)dx\,dy = \iint_{D*} f(x(u,v),y(u,v))\left|\frac{\partial(x,y)}{\partial(u,v)}\right| du\,dv = \iint_{D*} f(u,v)dA^*$$

Area elements:

Cartesian coordinates:	$dA = dx\,dy$
Linear transformation $x = au + bv,\ y = cu + dv$:	$dA = \lvert ad - bc\rvert du\,dv$
Polar coordinates:	$dA = r\,dr\,d\theta$
General case:	$dA = \left\lvert\frac{\partial(x,y)}{\partial(u,v)}\right\rvert du\,dv$

Triple integrals:

$$\iiint_W f\,dV = \iiint_W f(x,y,z)dx\,dy\,dz =$$

$$\iiint_{W*} f(x(u,v,w),y(u,v,w),z(u,v,w))\left|\frac{\partial(x,y,z)}{\partial(u,v,w)}\right| du\,dv\,dw = \iiint_{W*} f(u,v,w)dV^*$$

Volume elements:

Cartesian coordinates:	$dV = dx\,dy\,dz$
Cylindrical coordinates:	$dV = r\,dr\,d\theta\,dz$
Spherical coordinates:	$dV = \rho^2 \sin\varphi\,d\rho\,d\varphi\,d\theta$
General case:	$dV = \left\lvert\frac{\partial(x,y,z)}{\partial(u,v,w)}\right\rvert du\,dv\,dw$