Jacobians

Suppose we have a triple integral in the set of variables x, y, z:

$$\int\int\int f(x,y,z)\,dx\,dy\,dz$$

Let r, s, t be another set of variables, related to x, y, z by the equations

$$r = r(x,y,z), \qquad s = s(x,y,z), \qquad t = t(x,y,z)$$

The **Jacobian** of x, y, z with respect to r, s, t is:

$$J = \frac{\partial(x,y,z)}{\partial(r,s,t)} = \begin{vmatrix} \frac{\partial x}{\partial r} & \frac{\partial x}{\partial s} & \frac{\partial x}{\partial t} \\ \frac{\partial y}{\partial r} & \frac{\partial y}{\partial s} & \frac{\partial y}{\partial t} \\ \frac{\partial z}{\partial r} & \frac{\partial z}{\partial s} & \frac{\partial z}{\partial t} \end{vmatrix}$$
