MULTIVARIABLE INTEGRALS

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An integral in one variable is the area under a curve, and it is calculated by multiplying the infinitesimal area of each "line" at x by the infinitesimal change in x, $\mathrm{d}x$, and addimg them up. Similarly, an integral in two variables, is a volume, and it is calculated by multiplying all of the areas at each point x and multiplying by $\mathrm{d}x$. Each of these areas is $\int f(x,y)\,\mathrm{d}y$, so the total volume is $\int\int f(x,y)\,\mathrm{d}y\,\mathrm{d}x$.