

# Multiple Integrations

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**Lucas Duchet-Annez**

## Multiple Integrations

### Definition

Multiple integrals are a way of extending the concept of a single integral to integrate functions with more than one variable. In other words, a multiple integral is a mathematical operation that calculates the integral of a function with multiple variables, such as a function of two variables ( $x$  and  $y$ ) or a function of three variables ( $x$ ,  $y$ , and  $z$ ). These integrals can be used to solve a variety of problems in mathematics and other fields, such as finding the volume of a three-dimensional object or calculating the amount of force acting on a surface. The general form of a multiple integral is:  $\iiint f(x, y, z) \, dx \, dy \, dz$

where  $f(x, y, z)$  is the function being integrated, and  $dx$ ,  $dy$ , and  $dz$  are the differentials of the variables  $x$ ,  $y$ , and  $z$ , respectively. The process of evaluating a multiple integral involves breaking the region over which the integral is being calculated into many small subregions and calculating the integral over each subregion. This can be a complex process, but there are many tools and techniques that can be used to make it easier.