

# Triple Integrals

## Purpose

The purpose of this lab is to acquaint you with for triple integrals.

## Getting Started

To assist you, there is a worksheet associated with this lab that contains examples. On your Maple screen go to File - Open then type the following in the white rectangle:

```
\\storage\academics\math\calclab\MA1024\tripleintegrals.mw
```

## Background

With triple integrals you may work in three **or** four dimensions. Whether you are finding volume or a four-dimensional integral, the limits of integration are given as a **three-dimensional domain**.

$$\iiint_T f(x, y, z) dV = \lim_{|P| \rightarrow \infty} \sum_{i=1}^n f(x_i^*, y_i^*, z_i^*) \Delta V$$

In double integrals the three-dimensional function could be pictured as well as the two-dimensional domain. In triple integrals, the four-dimensional function cannot be visualized but the three-dimensional domain can be.

## Exercises

1. Find the volume of the cylinder  $z = \sqrt{x^2 + y^2}$  bounded by the planes  $z = -2$  and  $z = 4$  in Cartesian coordinates by integrating in the order  $dz dy dx$ .
2. Find the value of the triple integral of

$$w = 85z(1 - 50x^2 + y^2)$$

given the domain is the volume bounded by  $z = -\sin(x) + y$  and  $z = -\sqrt{4x^2 + 8y^2} + 1$ .