

Triple Integrals

Purpose

The purpose of this lab is to acquaint you with the Maple commands 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\ti.mws
```

You can copy the worksheet now, but you should read through the lab before you load it into Maple. Once you have read to the exercises, start Maple, load the worksheet, and go through it carefully. Then you can begin the exercises.

Background

In double integrals we saw how to calculate volume by integrating a three dimensional function using limits of integration of a bounded **AREA**. In triple integrals, the integral will be taken of a four-dimensional function using limits of integration of a bounded **VOLUME**.

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

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. Remember this, with triple integrals the plot represents the limits of integration.

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

$$w = z(1 + 5x^2 + y^2)^2$$

given the domain as the volume bounded by the plane $z = \frac{4}{9}$ and $z = \frac{1}{1+5x^2+y^2}$.