Section 11 Math 2202

Triple Integrals: Changing Order of Integration and Changing Coordinates

1. **Warm Up** Set up an iterated integral for

$$\int\int\int_E x^2 e^y \, dV$$

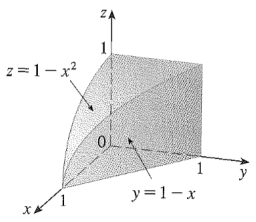
where E is bounded by the parabolic cylinder $z = 1 - y^2$ and the planes $z = 0, x = 1$ and $x = -1$.

Draw two pictures. One should be a "good enough" picture of E and the other a picture of the projection of E onto the coordinate plane corresponding to the order of integration you chose.

2. **Changing Order of Integration in Triple Integrals**

The figure on page 881 in the text shows the region of integration for the triple integral

$$\int_0^1 \int_0^{1-x^2} \int_0^{1-x} f(x, y, z) \, dy \, dz \, dx.$$



(a) Rewrite the integral in the order $dy\,dx\,dz$.

(b) Rewrite the integral in the order $dz\,dy\,dx$.

(c) How many integrals are needed if you project the solid into the yz-plane?

3. Set up a triple integral to find the volume of the solid bounded by $z = \sqrt{x^2 + y^2}$ and $x^2 + y^2 + z^2 = 4$.

(a) In spherical coordinates

(b) In cylindrical coordinates

(c) In rectangular coordinates[1]

[1] How does this integral compare with the same question from section last week, where you used a double integral?