Math 251

Workshop 10: Triple integrals: do me a solid

November 4, 2013

Due: November 6, 2013 Name:

1 Workshop 10: Triple integrals: do me a solid

This workshop gives you a chance to practice setting up triple integrals.

1.1 Integrals: do me a solid

1. Let E be the region under the plane 2x + 3y + z = 6 that lies in the first octant. Draw the region. In this case, I suggest drawing the plane by first drawing the points where it intersects the coordinate axes, and then drawing the triangle these points determine. Evaluate the integral

$$\iiint_E x \, dV$$

in the order dz dy dx, verifying that the result is 9/2. In your figure, make sure to draw a typical slice containing a typical segment.

2. Describe the regions expressed by the iterated integrals.

(a)
$$\int_{-2}^{4} \int_{2}^{6} \int_{0}^{5} f(x, y, z) \, dy \, dx \, dz$$

(b)
$$\int_0^3 \int_0^3 \int_0^{3-y} f(x, y, z) dz dy dx$$

(c)
$$\int_0^2 \int_0^3 \int_{4x/3}^4 f(x, y, z) dz dx dy$$

(d)
$$\int_{-3}^{3} \int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} \int_{-\sqrt{9-x^2-y^2}}^{\sqrt{9-x^2-y^2}} f(x, y, z) dz dy dx$$

(e)
$$\int_{-3}^{3} \int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} \int_{-3}^{3} f(x, y, z) \, dz \, dy \, dx$$