MATH 2130 Tutorial 11

1. Evaluate the triple integral of the function $f(x, y, z) = x$ over the volume bounded by the surfaces

$$2x + 3y + z = 6, \quad x = 0, \quad y = 0, \quad z = 0.$$

2. Find the volume in the first octant bounded by the surfaces

$$4x + 4y + z = 16, \quad z = 0, \quad y = x/2, \quad y = 2x.$$

3. Set up, but do **NOT** evaluate, a triple iterated integral for the volume in the first octant bounded by the surfaces

$$z = 2x + y, \quad 9x^2 + 4y^2 = 1, \quad x = 0, \quad y = 0, \quad z = 0.$$

4. Set up, but do **NOT** evaluate, a triple iterated integral for the volume bounded by the surfaces

$$z = 9 - x^2 - y^2, \quad z = x^2.$$

5. Find the volume bounded by the surfaces

$$z = xy, \quad x^2 + y^2 = 1, \quad z = 0.$$

6. Find the volume bounded by the surfaces

$$z = 2\sqrt{x^2 + y^2} \quad \text{and} \quad z = 9 - x^2 - y^2.$$

Get a numerical answer, but do not simplify it.

7. Set up, but do **NOT** evaluate, a triple iterated integral for the triple integral of the function $f(x, y, z) = x^2 + y^3$ over the volume bounded by the surfaces

$$(x^2 + y^2)^2 = 2xy, \quad z = \sqrt{1 - x^2 - y^2}, \quad z = 0.$$

Answers

1. $9/2$ **2.** $128/9$ **3.** $\displaystyle\int_0^{1/3} \int_0^{(1/2)\sqrt{1-9x^2}} \int_0^{2x+y} dz\, dy\, dx$

4. $\displaystyle 4\int_0^{3/\sqrt{2}} \int_0^{\sqrt{9-2x^2}} \int_{x^2}^{9-x^2-y^2} dz\, dy\, dx$

5. $1/2$ **6.** $\displaystyle 2\pi\left[\frac{9(\sqrt{10}-1)^2}{2} - \frac{(\sqrt{10}-1)^4}{4} - \frac{2(\sqrt{10}-1)^3}{3}\right]$

7. $\displaystyle 2\int_0^{\pi/2} \int_0^{\sqrt{\sin 2\theta}} \int_0^{\sqrt{1-r^2}} r^3 \cos^2\theta\, dz\, dr\, d\theta.$