

MATH 2130 Summer Evening 2013 Problem Workshop 7

1. Set up but do not evaluate a triple iterated integral for the volume bounded by the surfaces

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

2. Find the volume bounded by the surfaces

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

3. Find the volume bounded by the surfaces

$$z = 2\sqrt{x^2 + y^2}, \quad z = 9 - x^2 - y^2$$

(Do not simplify your numerical answer.)

4. Set up but do not evaluate a triple iterated integral for the triple integral of the function $f(x, y, z) = x^2$ over the region bounded by the surfaces

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

5. Evaluate $\iiint_V x^2 dV$ where V is the region bounded by the xz -plane and the hemispheres $y = \sqrt{9 - x^2 - z^2}$ and $y = \sqrt{16 - x^2 - z^2}$.
6. Find the volume and centroid of the region V that lies above the cone $z = \sqrt{x^2 + y^2}$ and below the sphere $x^2 + y^2 + z^2 = 1$.

Answers:

1. $4 \int_0^{3/\sqrt{2}} \int_0^{\sqrt{9-2x^2}} \int_{x^2}^{9-x^2-y^2} dz dy dx$

2. $1/2$

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

4. $2 \int_0^{\pi/2} \int_0^{\sqrt{\sin 2\theta}} \int_0^{\sqrt{1-r^2}} r^3 \cos^2 \theta dz dr d\theta$

5. $\frac{1562}{15} \pi$

6. $\frac{\pi}{3}(2 - \sqrt{2}), (0, 0, \frac{3}{8(2-\sqrt{2})})$