Calculus III Workshop questions: 10/19/16

Problem 1 (15.7, #36)**.** Write five other iterated integrals that are equal to the iterated integral

$$\int_0^1 \int_y^1 \int_0^z f(x,y,z)\,dx\,dy\,dz.$$

Problem 2 (15.8, #19)**.** Evaluate $\iiint_E (x+y+z)\,dV$ where E is the solid in the first octant that lies under the paraboloid $z = 4 - x^2 - y^2$.

Problem 3 (15.8, #20)**.** Evaluate $\iiint_E x\,dV$ where E is enclosed by the planes $z = 0$ and $z = x + y + 5$, and by the cylinders $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$.

Problem 4 (15.8, #25)**.**

(a) Find the volume of the region E bounded by the paraboloids $z = x^2 + y^2$ and $z = 36 - 3x^2 - 3y^2$.

(b) Find the centroid of E (center of mass assuming constant density).

Problem 5 (15.8, #29, #30)**.** Evaluate the integrals by changing to cylindrical coordinates:

(a) $\int_{-2}^{2} \int_{-\sqrt{4-y^2}}^{\sqrt{4-y^2}} \int_{\sqrt{x^2+y^2}}^{2} xz\,dz\,dx\,dy$

(b) $\int_{-3}^{3} \int_{0}^{\sqrt{9-x^2}} \int_{0}^{9-x^2-y^2} \sqrt{x^2+y^2}\,dz\,dy\,dx.$