Assignment 5

Coverage: 15.6, 15.7 in Text.

Exercises: 15.6. no. 9, 12, 13, 21. 15.7. no. 14, 15, 19, 26, 32, 34, 37, 42, 54, 76.

Submit 15.7. no. 14, 19, 37, 42, by Feb 22.

Supplementary Problems

1. (Optional) Let P be a plane given by the equation $ax+by+cz=d$. Show that the distance from a point (x_0, y_0, z_0) to P is given by the formula

$$\frac{|ax_0+by_0+cz_0-d|}{\sqrt{a^2+b^2+c^2}} \ .$$

Hint: Treat it as a constrained minimization problem.

2. Let Ω be a region in space which is symmetric with respect to the xy-plane, that is, $(x,y,z) \in \Omega$ if and only if $(x,y,-z) \in \Omega$. Show that

$$\iiint_\Omega f(x,y,z)\, dV = 0 \ ,$$

when f is odd in z, that is, $f(x,y,-z) = -f(x,y,z)$ in Ω. You may assume Ω is of the form $\{(x,y,z) : \ f_1(x,y) \le z \le f_2(x,y), (x,y) \in D\}$ and $f_2 = -f_1 \ge 0$.