Math 21D
Kouba
Discussion Sheet 9

1.) Find the area of the following surfaces S, which are directly above the rectangular region R with vertices $(0,0)$, $(2,0)$, $(2,4)$, and $(0,4)$ in the xy-plane.

a.) plane $z = 5$
b.) plane $z = 2y$
c.) plane $x + 2y + 3z = 12$

2.) Find the area of the following surfaces S, which are directly above the disc $x^2 + y^2 \leq 9$ in the xy-plane.

a.) top half of sphere $x^2 + y^2 + z^2 = 64$
b.) paraboloid $z = x^2 + y^2 + 1$
c.) cone $z = \sqrt{x^2 + y^2}$

3.) Let surface S be the top half of the sphere $x^2 + y^2 + z^2 = 4$. Define the following function g on S : $g(P) = g(x, y, z)$ is the square of the distance from P to the xy-plane. Compute the surface integral of g over S.

4.) Let surface S be that portion of the paraboloid $z = x^2 + y^2 + 4$ directly above the disc $x^2 + y^2 \leq 1$ in the xy-plane. Let function $g(x, y, z) = \sqrt{x^2 + y^2}$. Compute the surface integral of g over S.

5.) Let surface S be that portion of the paraboloid $z = 4 - x^2 - y^2$ cut by the plane $z = 0$. Find the Flux of the vector field $\vec{F}(x, y, z) = (y)\vec{i} + (x)\vec{j} + (z)\vec{k}$ outward through the surface S.

6.) Find the Flux of the vector field $\vec{F}(x, y, z) = (2x)\vec{i} + (-3y)\vec{j} + (z)\vec{k}$ in the direction away from the origin and across the region S in the plane $x + 2y + 3z = 12$, which is directly above the triangle with vertices $(0,0)$, $(0,2)$, and $(2,6)$ in the xy-plane.

THE FOLLOWING PROBLEM IS FOR RECREATIONAL PURPOSES ONLY.

7.) Two bicyclists are twelve miles apart. They begin riding toward each other, one pedaling at 4 mph and the other at 2 mph. At the same time a bumblebee begins flying back and forth between the riders at a constant speed of 10 mph. What is the total distance the bumblebee travels by the time the riders meet ?