MATH 264B Advanced Calculus, Winter 2006

Assignment 3, due in class on Thursday February 16, 2006

1. Compute the surface integral
$$\iint_S dS,$$
where S is the portion of the cone $x^2 + y^2 - z^2 = 0$ which lies inside the sphere $x^2 + y^2 + z^2 - 2Rz = 0$, where R is a positive constant.

2. Compute the surface integral
$$\iint_S x\, dS,$$
where S is the rectangle with vertices $(1, 0, 1), (2, 0, 0), (1, 1, 1)$ and $(2, 1, 0)$.

3. Compute the surface integral
$$\iint_S \mathbf{F}.d\mathbf{S},$$
where S is the part of the cone $z^2 = x^2 + y^2$ with $1 \leq z \leq 2$, oriented with the normal pointing out of the cone, and $\mathbf{F} = (x^2, y^2, z^2)$.

4. Compute the surface integral
$$\iint_S \mathbf{F}.d\mathbf{S},$$
where S is the upper hemisphere $x^2+y^2+z^2 = 1, z \geq 0$, and its base $x^2+y^2 \leq 1, z = 0$, oriented with the outward pointing normal, and $\mathbf{F} = (2x, 2y, 2z)$.

5. Compute the surface integral
$$\iint_S \mathbf{F}.d\mathbf{S},$$
where S is the cylinder $x^2 + y^2 = 1, 0 \leq z \leq 1$, oriented with the outward pointing normal, and $\mathbf{F} = (x, y, -y)$.