

# Worksheet 13, Math 53

## Parametric Surfaces and Surface Integrals

Wednesday, November 28, 2012

1. Determine a parametric representation of the part of the sphere  $x^2 + y^2 + z^2 = 16$  which lies above the cone  $z = \sqrt{x^2 + y^2}$ .
2. Determine a parametric representation of a Möbius strip.
3. If the surface  $S$  is represented by  $z = f(x, y)$  on the domain  $x^2 + y^2 \leq R^2$ , and you know that  $|f_x| \leq 1$  and  $|f_y| \leq 1$ , then what can you say about the surface area of  $S$ ?
4. Evaluate the surface integral  $\iint_S y^2 dS$ , where  $S$  is the part of the sphere  $x^2 + y^2 + z^2 = 4$  that lies inside the cylinder  $x^2 + y^2 = 1$  and above the  $xy$ -plane.
5. Evaluate the surface integral  $\iint_S \langle xy, 4x^2, yz \rangle \cdot d\mathbf{S}$ , where  $S$  is the surface  $z = xe^y$  for  $0 \leq x \leq 1$  and  $0 \leq y \leq 1$ , with upward orientation.
6. Let  $\mathbf{F}$  be an inverse square field, that is,  $\mathbf{F}(\mathbf{r}) = c\mathbf{r}/|\mathbf{r}|^3$  for some constant  $c$ , where  $\mathbf{r} = \langle x, y, z \rangle$ . Show that the flux of  $\mathbf{F}$  across a sphere  $S$  with center the origin is independent of the radius of  $S$ .