Math 241 X8 **Name(s):**

Homework 11 supplement

This is a written homework supplement to the homework for Unit 12: Surface Integrals.

Consider the surface R_1 given by $y = x^2 + z^2$ for $0 \leq y \leq 1$; the surface R_2 that is the disk with $y = 1$, $x^2 + z^2 \leq 1$; and the vector field $\mathbf{F}(x, y, z) = \langle 0, y, z \rangle$.

(1) Find the net flow of $\mathbf{F}$ across R_1 directly. Which direction is it? (You may use Mathematica to plot the surface for you. Set up and perform the integral by hand.)

(2) Find the net flow of $\mathbf{F}$ across R_2 directly. Which direction is it?

(3) Find the volume of the region bounded by R_1 and R_2.

(4) Find the divergence of $\mathbf{F}$.

(5) What relation do you observe between the previous parts? Should you have expected this?

(6) Find the surface area of R_1.