Take-home Quiz #5
Math 213-002
May 2, 2014

Find the flux of vector field $\mathbf{F} = \langle 0, y, z \rangle$ across part of the cylindrical surface $x^2 + y^2 = R^2$ located between the planes $z=0$ and $z=1$, in the outward direction. Follow these steps:

1. Find $\mathbf{n}\, d\sigma = \pm \left(\dfrac{\partial \mathbf{r}}{\partial \theta} \times \dfrac{\partial \mathbf{r}}{\partial z} \right) d\theta\, dz$, using cylindrical parametrization: $\mathbf{r}(\theta, z) = \langle R\cos\theta, R\sin\theta, z \rangle$

2. Calculate the dot product $\mathbf{F} \cdot \mathbf{n}\; d\sigma$

3. Evaluate the integral over the surface of this cylinder: $\displaystyle\iint\limits_{S} \mathbf{F} \cdot \mathbf{n}\; d\sigma$