Surface Integrals

Welcome to the Weekly Review for MATH 2451. This week’s review talks about Surface Integrals. We would like to thank Leszek Kisielewski and the Spring 2015 MATH 2451 students for allowing us to film the Weekly Reviews.

The following problems are presented in the video. Thank you!

1. Background Information
2. Consider the closed surface $S$ consisting of the graph $z = 1 - \sqrt{x^2 + y^2}$ with $z \geq 0$ and the unit disk $x^2 + y^2 \leq 1$ with $z = 0$. Give the surface an outer normal. Compute $\int\int_S F \cdot d\mathbf{S}$, where $F(x, y, z) = \begin{bmatrix} x \\ y \\ 3 \end{bmatrix}$. 
3. Evaluate $\int \int_S \mathbf{F} \cdot d\mathbf{S}$, where $S$ is the lateral side of the cylinder $x^2 + y^2 = 4$ with $1 \leq z \leq 3$. 
4. Green’s Theorem
5. Let $C$ be described by the closed path on the board. Evaluate $\oint_C xy \, dx + x^2 \, dy$. 
6. Show that $\text{Area(ellipse)} = \pi ab$ using Green’s Theorem