Calc III: Workshop 11, Fall 2017

Problem 1. Find the surface area of the part of the plane $x + 2y + 3z = 1$ which lies inside the cylinder $x^2 + y^2 = 3$.

Problem 2. Find the surface area of the part of the cone $z = \sqrt{x^2 + y^2}$ between $z = 0$ and $z = H$.

Problem 3. Find the flux $\iint_S \mathbf{F} \cdot \mathbf{n} \, dS$ of the vector field $\mathbf{F}(x, y, z) = 2x\mathbf{i} + 2y\mathbf{j} + 2z\mathbf{k}$ across the unit sphere $x^2 + y^2 + z^2 = 1$, oriented with outward facing unit normal vector.

Problem 4. Compute the flux $\iint_S \mathbf{F} \cdot \mathbf{n} \, dS$ of the vector field $\mathbf{F}(x, y, z) = xy\mathbf{i} + yz\mathbf{j} + zx\mathbf{k}$, where S is the part of the paraboloid $z = 4 - x^2 - y^2$ lying over the square $0 \leq x \leq 1$, $0 \leq y \leq 1$ and has upward orientation.