Section 16.9: Additional Problems

1. Example: Let S be the sphere $x^2 + y^2 + z^2 = 16$ with a positive orientation and $\mathbf{F} = \langle 0, 0, z \rangle$. Use the Divergence Theorem to evaluate $\iint_S \mathbf{F} \cdot d\mathbf{S}$

2. Let S be the closed surface of a tetrahedron with vertices $(0,0,0)$, $(1,0,0)$, $(0,1,0)$, and $(0,0,1)$, i.e .the surface of the solid in the first octant that is formed by the plane $x + y + z = 1$ and the three coordinate planes. Let $\mathbf{F} = \langle y, z - y, x \rangle$ and use positive orientation.

   Evaluate $\iint_S \mathbf{F} \cdot d\mathbf{S}$

3. Calculate the flux of $\mathbf{F}$ across the surface S with the equation $x^4 + y^4 + z^4 = 1$. Assume positive orientation for the surface.

   $\mathbf{F} = \left\langle x + e^{y \tan(z)},\ 3xe^{xz},\ \cos(y) - z \right\rangle$

Fun Question: This question is for those of you who find this interesting. This is not an exam question.

Compute $\iint_S (3x + 8y + z^2) dS$ Where S is the surface of the sphere $x^2 + y^2 + z^2 = 1$