About this assignment: This assignment illustrates surface integral computations of various kinds:

- Scalar surface integrals $\iint_S f \, dS$ (the analog of scalar line integrals $\int_C f \, ds$).
- Vector surface integrals $\iint_S \vec{F} \cdot dS$ (the analog of vector line integrals $\int_C \vec{F} \cdot d\vec{r}$).
- Direct computation for surfaces given by a parametrization $\vec{r}(u, v)$.
- Direct computation for surfaces given as $z = f(x, y)$, i.e., the graph of a function $f(x, y)$.
- Direct computation via the normal component of $\vec{F}$ (a shortcut for some special cases, analogous to computing $\int_C \vec{F} \cdot d\vec{r}$ via the formula $\int_C (\vec{F} \cdot \vec{T}) \, ds$).
- Indirect computation via the Divergence Theorem (for closed surfaces; analogous to using Green's theorem to compute line integrals over closed curves).

HW 13 Problems

1. 16.7:17 (Scalar surface integral over hemisphere)
2. 16.7:23 (Vector surface integral (flux) over surface given by $z = f(x, y)$)
3. 16.7:39 (Center of mass of surface of a hemisphere) (Note that this is not the same as the center of mass of a solid hemisphere; the latter requires triple integrals.)
4. 16.7:47 (Vector surface integral (interpreted as heat flow) over cylindrical surface)
5. 16.7:48 (Vector surface integral (interpreted as heat flow) over spherical surface)
6. 16.9:3 (Verification of divergence theorem for solid sphere; “Verification” here means computing directly each side of the theorem, i.e., (a) the surface integral on the left, and (b) the volume integral on the right).
7. 16.9:10 (Computation of surface integral via divergence theorem: tetrahedral surface)
8. 16.9:12 (Computation of surface integral via divergence theorem: cylindrical surface)
9. 16.9:13 (Computation of surface integral via divergence theorem: spherical surface)
10. 16.9:26 (Volume computation via divergence theorem; note the analogy to the computation of areas via Green’s theorem.)