1. Let S be the plane $5x - y - z = 1$ over the region $0 \leq x \leq 2$ and $0 \leq y \leq 2$ oriented upward.
   - Construct $d\tilde{\mathbf{S}}$ for this surface.
   - Compute the surface integral $\iint_S \tilde{\mathbf{F}} \cdot d\tilde{\mathbf{S}}$ where $\tilde{\mathbf{F}} = 3\,\hat{\mathbf{x}} + z\,\hat{\mathbf{z}}$
2. Let Ω be the surface defined by $g(x, y) = \frac{2}{1+x^2+y^2}$ over the region $x^2 + y^2 \leq 5$ oriented upward.
   - Construct $d\tilde{\mathbf{S}}$ for Ω.
   - Let $\tilde{\mathbf{G}} = z\,\hat{\mathbf{z}}$. Compute $\iint_\Omega \tilde{\mathbf{G}} \cdot d\tilde{\mathbf{S}}$.
3. In spherical coordinates, $d\tilde{\mathbf{r}} = dr\,\hat{\mathbf{r}} + rd\theta\,\hat{\theta} + rsin\theta d\phi\,\hat{\phi}$. Nota bene that r is three-dimensional and θ is measured from the z-axis.
   - On the sphere of radius two, which variable(s) is(are) constant? That means the differential is what?
   - Construct two tangent vectors to the sphere and use them to obtain an outward-pointing normal vector.
   - How can you be sure that it's normal to the sphere?
   - Compute the flux of $\tilde{\mathbf{H}} = x\,\hat{\mathbf{x}} + y\,\hat{\mathbf{y}} + z\,\hat{\mathbf{z}}$ outward through the sphere of radius two.