1. Let $\mathcal{D}$ be the region in the first quadrant of the plane bounded by the curves $y = x$ and $y = x^3$. Write the integral $\int\int_{\mathcal{D}} f(x, y)\, \mathrm{d}A$ in the two possible orders.

2. Let $\mathcal{D}$ be the region in the plane bounded by the lines $y = 0$, $x = 0$, $y = 1$, and $y = -x + 2$. Write the double integral $\int\int_{\mathcal{D}} f(x, y)\, \mathrm{d}A$ as an iterated integral in both possible orders. Which is probably going to be less work to compute?

3. Compute the double integral $\int\int_{\mathcal{D}} \sqrt{y^3 + 1}\, \mathrm{d}A$ where $\mathcal{D}$ is the region of the first quadrant bounded by $y = 1$ and $y = \sqrt{x}$. Try to compute it in both orders– is one way easier than the other?

4. Compute the integral $\int_0^1 \int_{-\sqrt{1-x^2}}^{0} 2x \cos(y - y^3/3)\, \mathrm{d}y\, \mathrm{d}x$.

5. In this problem you'll compute the triple integral $\int\int\int_{\mathcal{W}} y\, \mathrm{d}V$ where $\mathcal{W}$ is the volume bounded between the paraboloids $z = x^2 + y^2$ and $z = 4 - (x^2 + y^2)$.
   (a) Draw a sketch of this region.
   (b) Observe that this region is z-simple and compute the projection of the region in the xy-plane.
   (c) Write the integral $\int\int\int_{\mathcal{W}} y\, \mathrm{d}V$ as an iterated integral. Since you described the region as z-simple you will write this integral as $\mathrm{d}z\, \mathrm{d}x\, \mathrm{d}y$ or $\mathrm{d}z\, \mathrm{d}y\, \mathrm{d}x$.
   (d) Compute the integral $\int\int\int_{\mathcal{W}} y\, \mathrm{d}V$. One of the two ways to set up this integral is much easier to compute than the other– why?