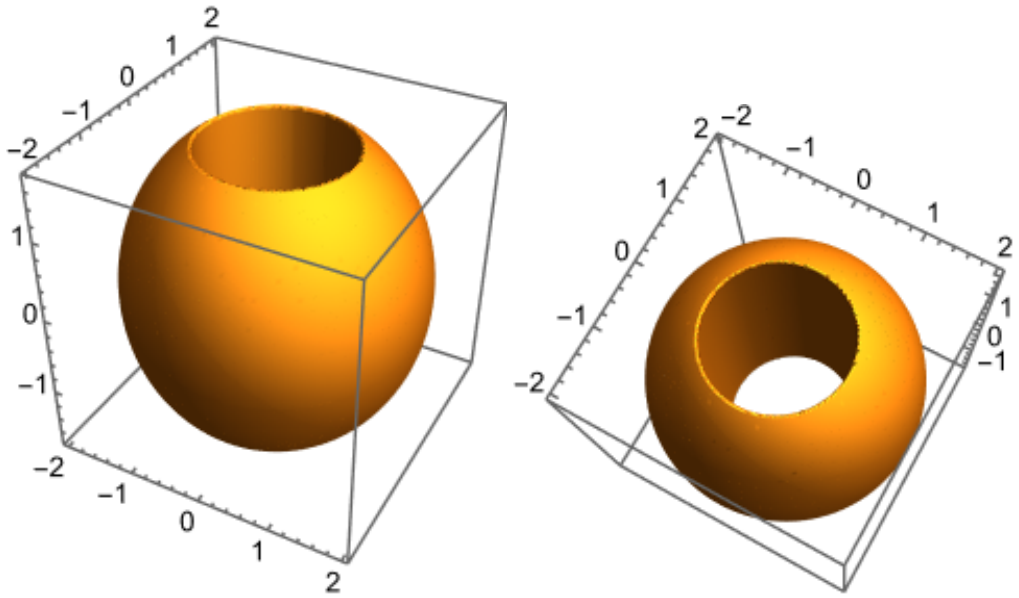
Checkpoint S8: Iterated integrals in cylindrical and spherical coordinates

A napkin ring is made by taking the sphere $x^2+y^2+z^2=4$ and drilling out the cylinder $x^2+y^2=1$. Here are some images of the resulting shape.



Find the volume of this shape. Hint: the answer is about 21.8.