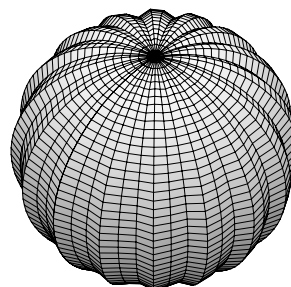


1. Let R denote the region in the first quadrant of the x - y plane bounded by the line $y = x$ and the parabola $y = x^2$. Compute
 - (a) the area of R ,
 - (b) the center of gravity of R .
2. Rewrite $\int_{-1}^2 dx \int_x^{x^3} f(x, y) dy$ as an iterated integral in the other order.
3. Let R denote the closed unit square: the region in the first quadrant of the x - y plane defined by the inequalities $0 \leq x \leq 1$ and $0 \leq y \leq 1$. Give a concrete example
 - (a) of a function f that is not uniformly continuous on R but that is Riemann integrable on R ,
 - (b) of a function f that is defined everywhere on R but that is not Riemann integrable on R .
4. Compute the surface area of the piece of the unit sphere $x^2 + y^2 + z^2 = 1$ on which all three coordinates x , y , and z are positive and in addition $x < 1/2$.
5. Prove from first principles that if f and g are continuous functions on a compact region R , and if $f(x, y) \leq g(x, y)$ for all points (x, y) in R , then $\iint_R f(x, y) dS \leq \iint_R g(x, y) dS$.
6. Model the surface of a pumpkin by the equation $r = 1 + a(\sin \varphi)|\cos 8\theta|$ in spherical coordinates, where a is a small positive number. As usual, r is the distance from the origin, the angle θ is the polar angle, and the angle φ is the co-latitude (the angle measured down from the positive z -axis). The figure illustrates the case $a = 1/10$.



Set up an integral that expresses the volume of the pumpkin. Do not evaluate the integral.