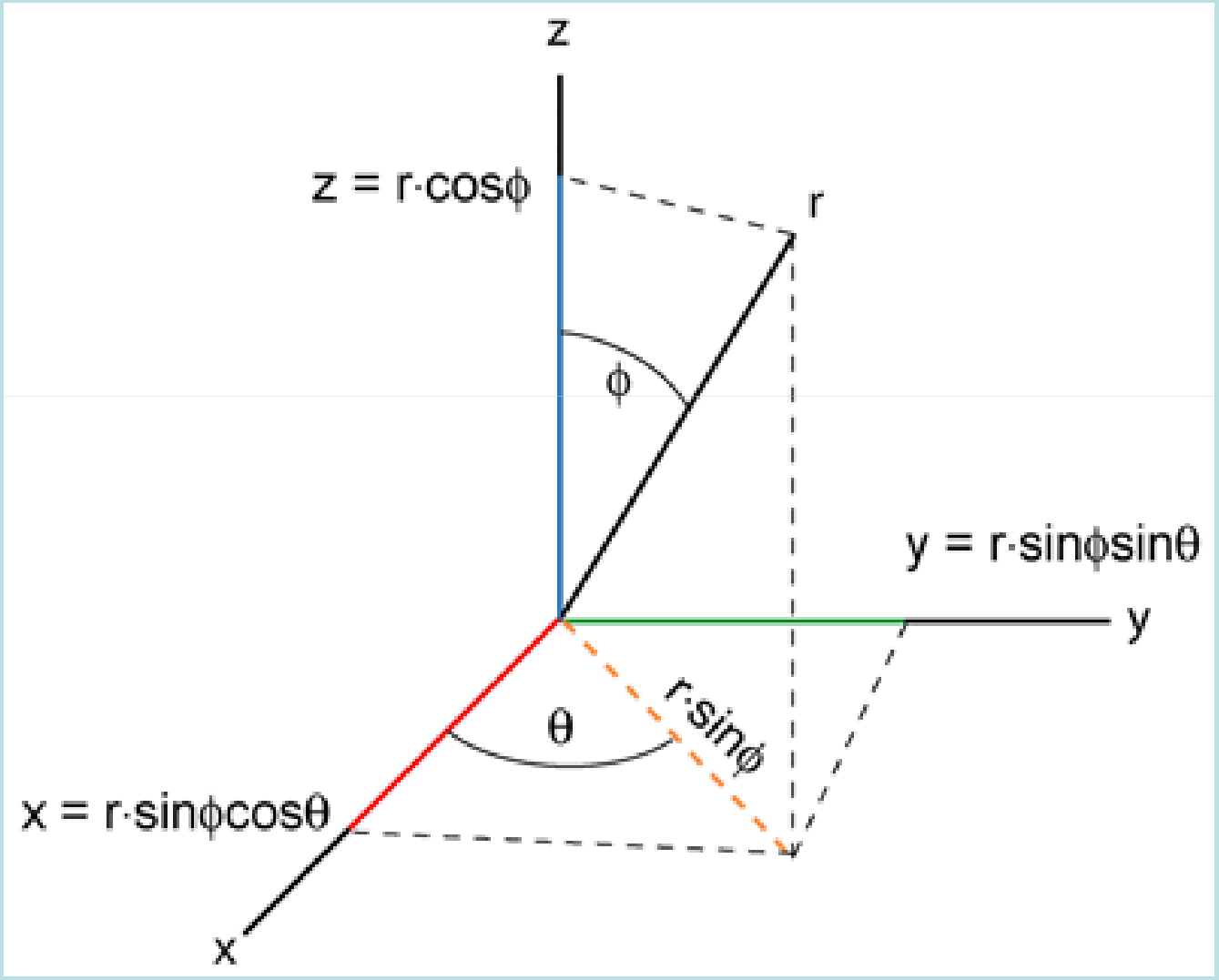
Volumes of Bumpy and Wrinkled Spheres by Triple Integration

By Abigail Edwards and Kyle Fender

Spherical Coordinates



r=.5

Φ=π/4

Θ=π/4

X=.5*.5=.25

Y=.5*.5=.25

Z=(√2)/4

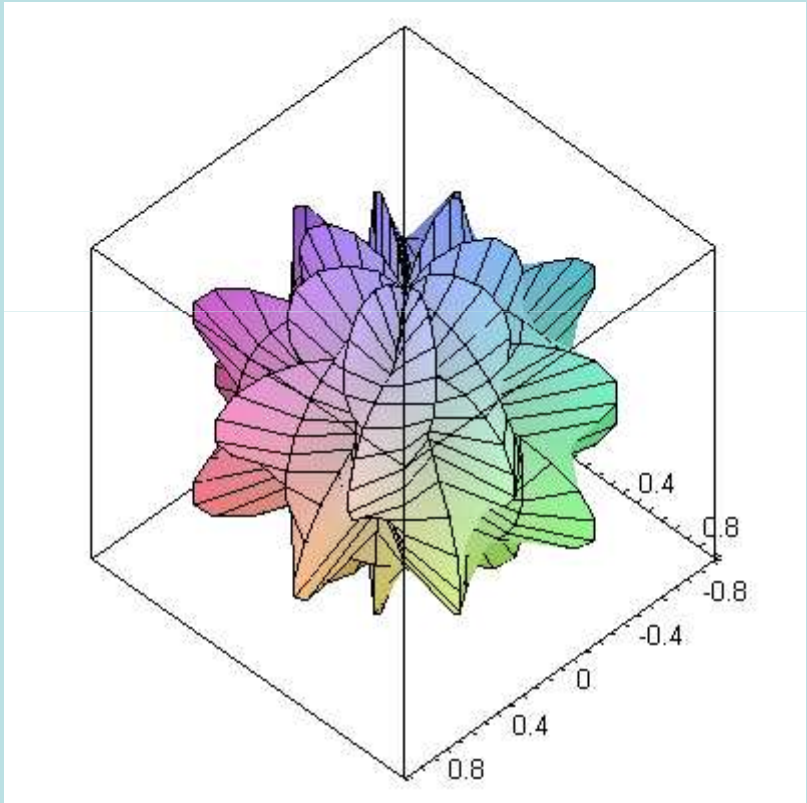
Volume of a Bumpy Sphere

- Equation of the Bumpy Sphere:

$f(\theta,\varphi)= 0.75 + 0.35*\sin(8\,\theta)*\sin(\varphi)$,

$0 \le \theta \le 2\pi,\ 0 \le \varphi \le \pi$

$V= 2.060361182$



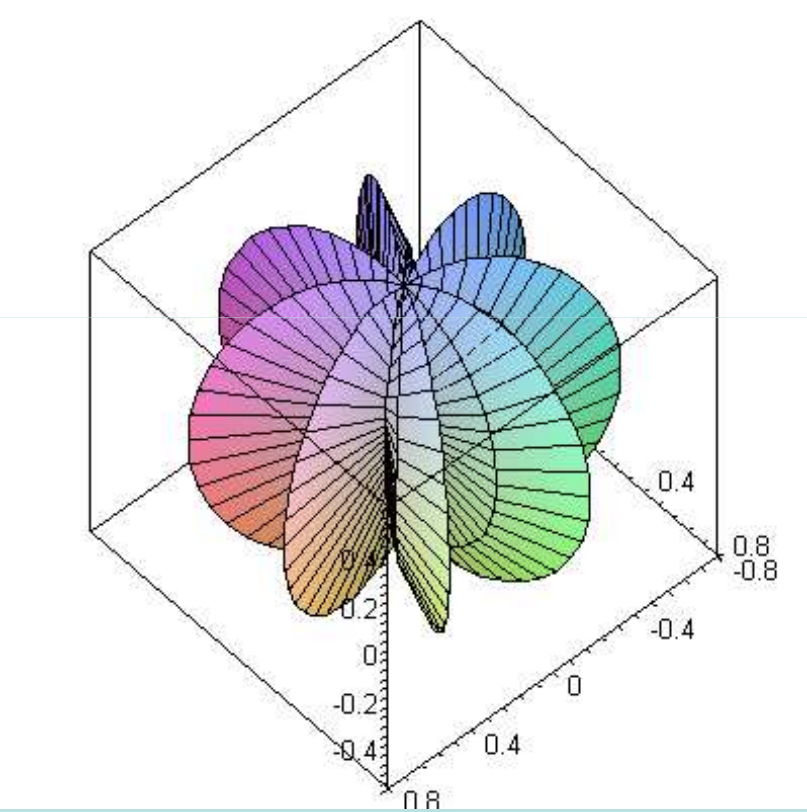
Triple Integration

$f(\theta,\varphi)= 0.75 + 0.35*\sin(8\,\theta)*\sin(\varphi),\ 0\le\theta\le 2\pi,\ 0\le\varphi\le\pi$

$V= 2.060361182$

$$\int_0^{2\pi}\int_0^{\pi}\int_0^{0.75+0.35\,\sin(8\,\theta)\,\sin(4\,\phi)} \rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta$$

Volume of a Wrinkled Sphere



- Equation of the wrinkled sphere:

$f(\theta,\varphi)=0.5+$

$0.345*\sin(8\,\theta)*\sin(\varphi),$

$0\leq\theta\leq2\pi,\ 0\leq\varphi\leq\pi$

$V= 0.7728842995$

Triple Integration

$f(\theta,\varphi)=0.5+0.345*\sin(8\,\theta)*\sin(\varphi),\ 0\le\theta\le 2\pi,\ 0\le\varphi\le\pi$

$V=0.7728842995$

$$\int_0^{2\pi}\int_0^{\pi}\int_0^{0.5+0.345\,\sin(8\,\theta)\sin(\phi)} \rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta$$