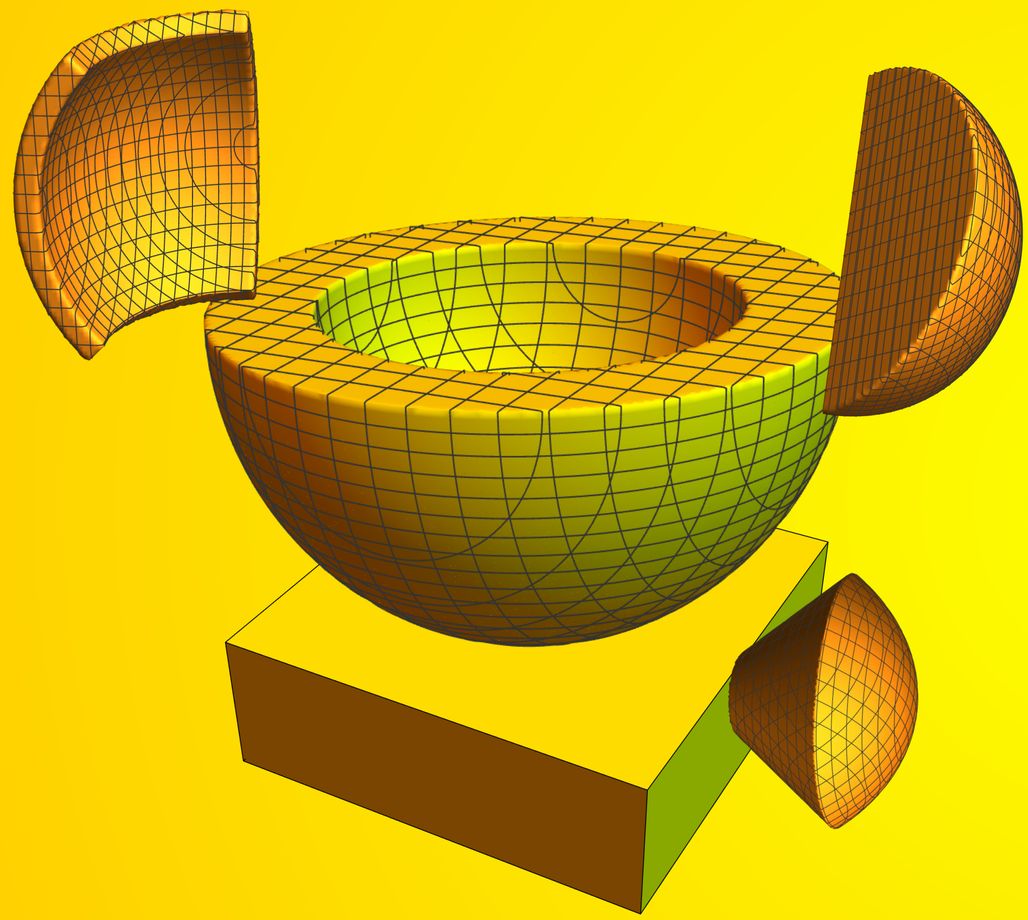

Lecture 10

Spherical

Integrals

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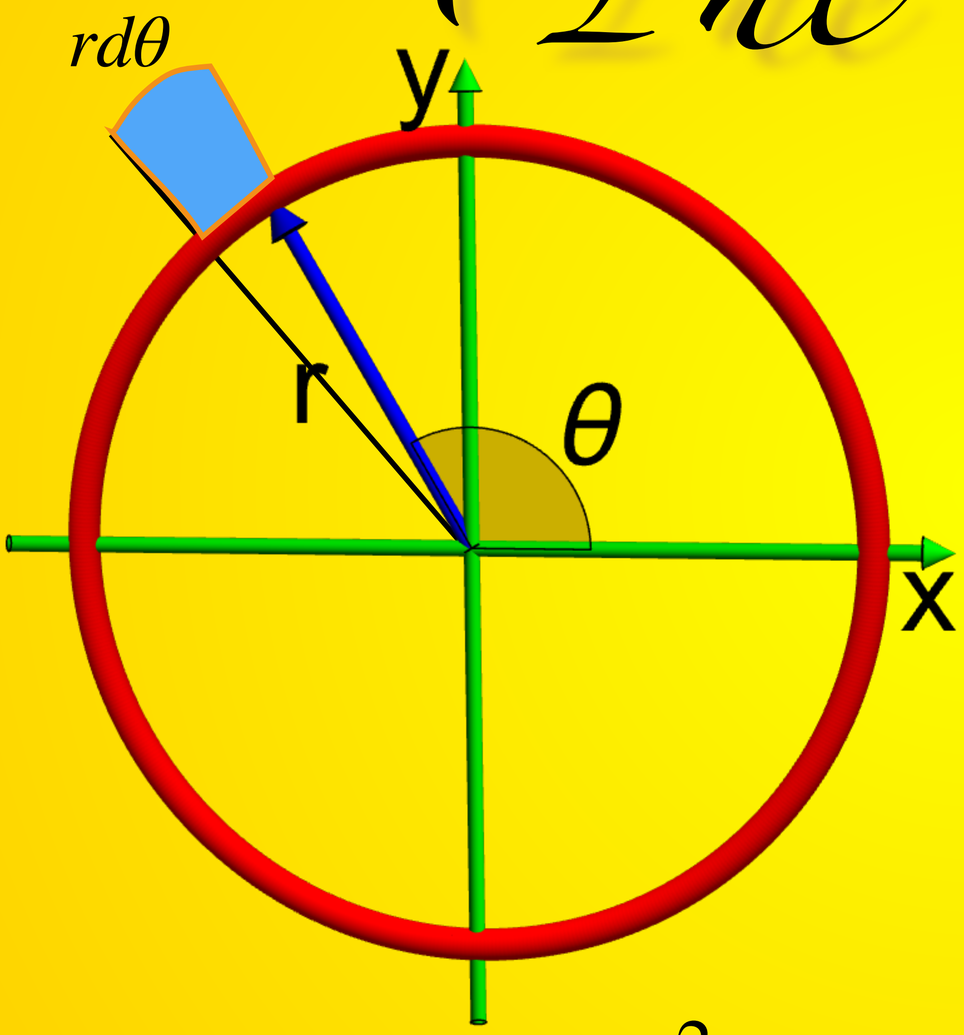
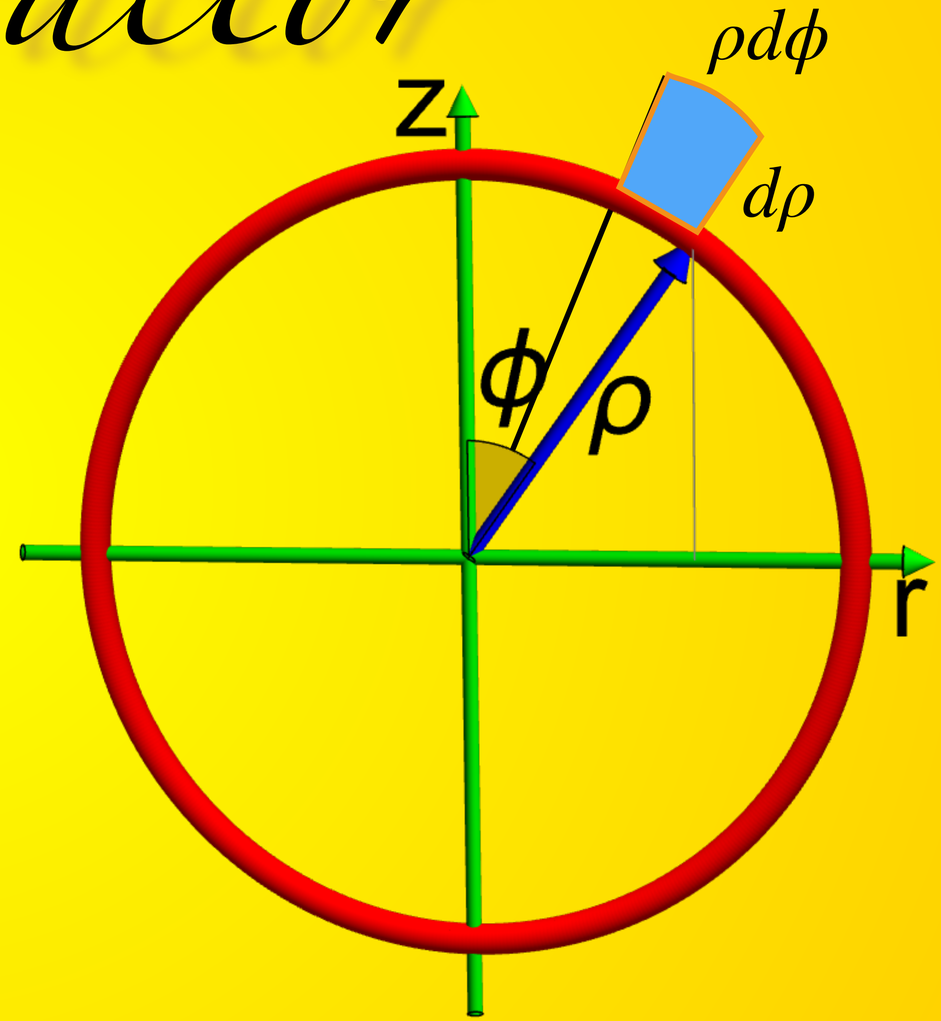
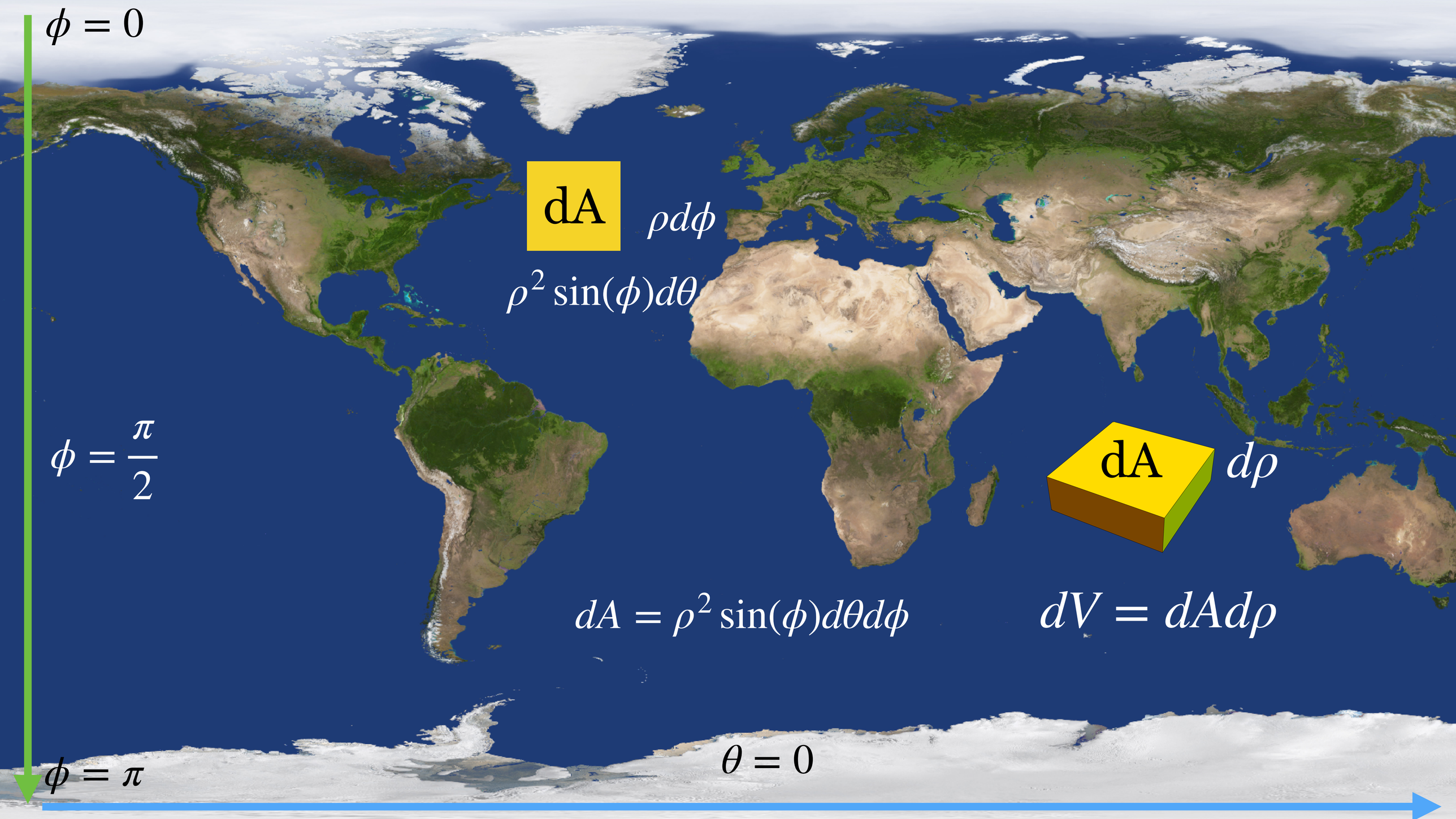
The Factor





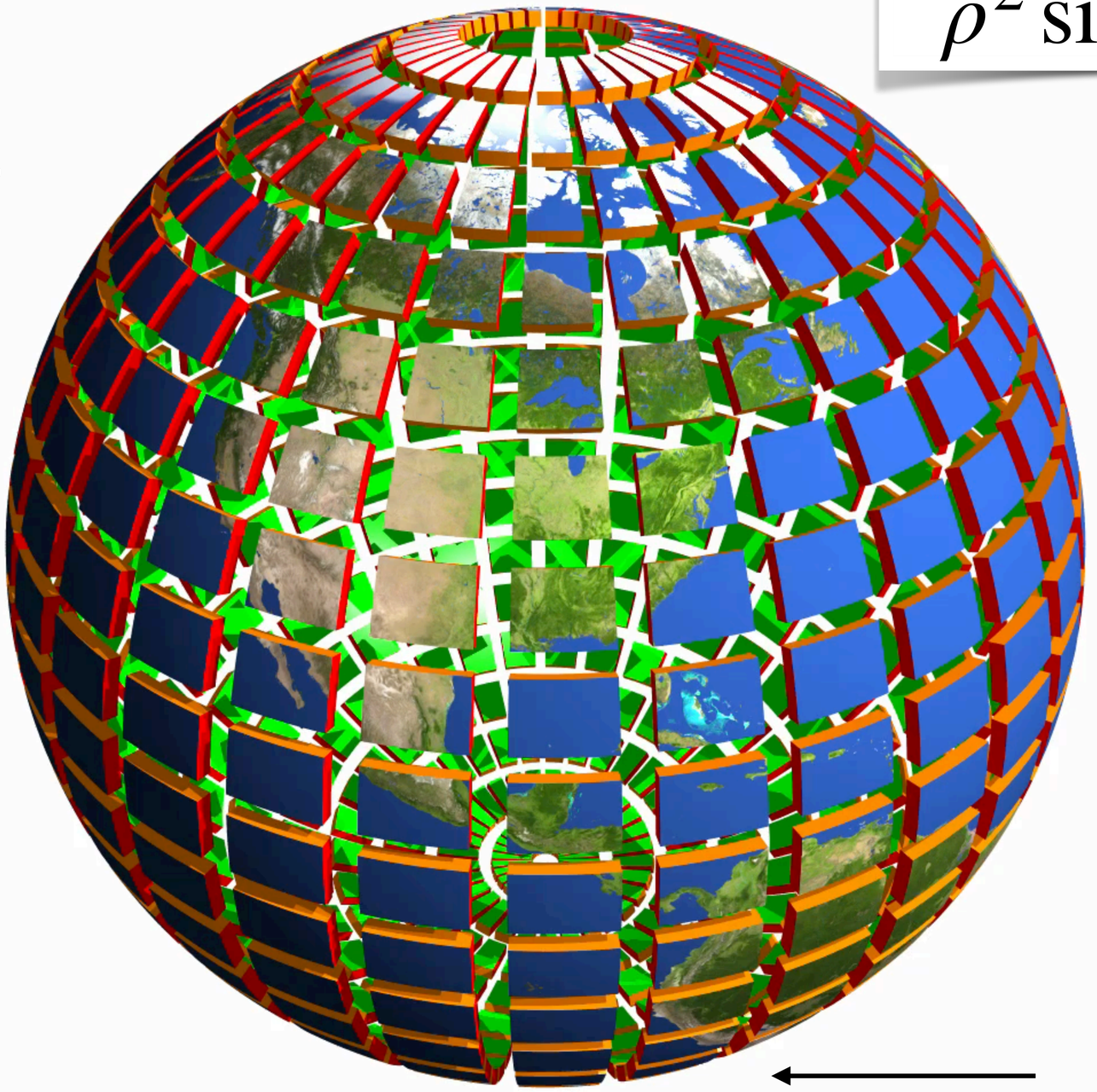
$$\rho^2 \sin(\phi) d\rho d\theta d\phi$$


$\phi = 0$
dA
$\rho d\phi$
$\rho^2 \sin(\phi) d\theta$
$\phi = \frac{\pi}{2}$
dA
$d\rho$
$dA = \rho^2 \sin(\phi) d\theta d\phi$
$dV = dA d\rho$
$\theta = 0$
$\phi = \pi$

area of sphere grows like ρ^2

$$\rho^2 \sin(\phi) d\rho d\theta d\phi$$

distortion factor

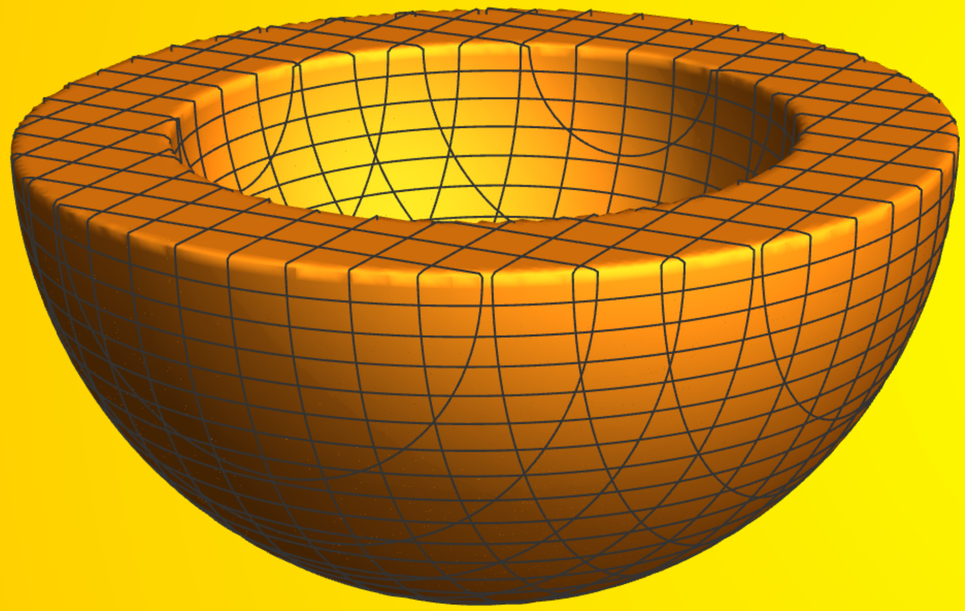


$\sin(\phi)$ large

$\sin(\phi)$ small

Some Solids

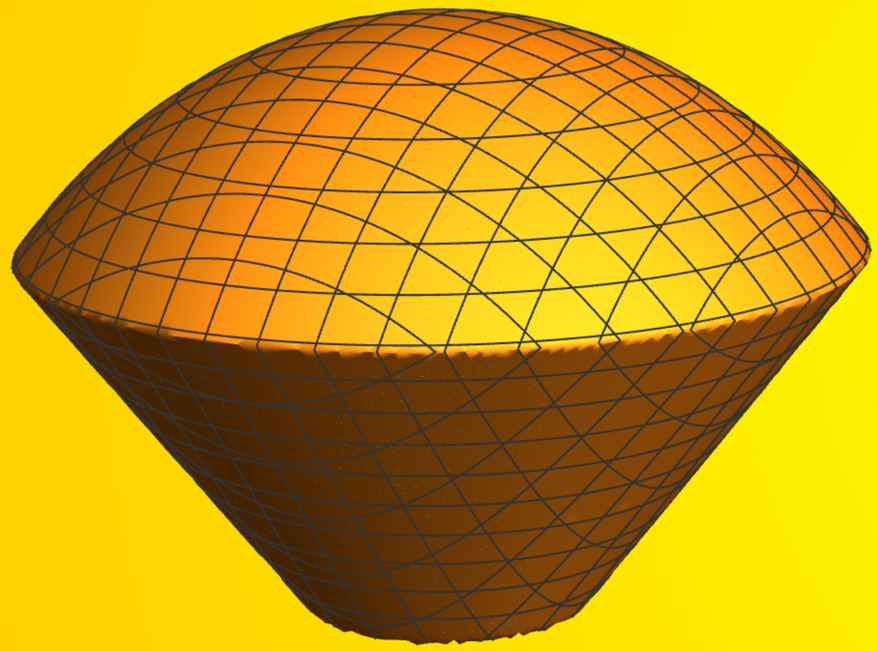
Avocado



$$\int_0^{2\pi}\int_{\pi/2}^{\pi}\int_2^3 f(x,y,z)\,\rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta$$

$$4 < x^2 + y^2 + z^2 < 9 \qquad z < 0$$

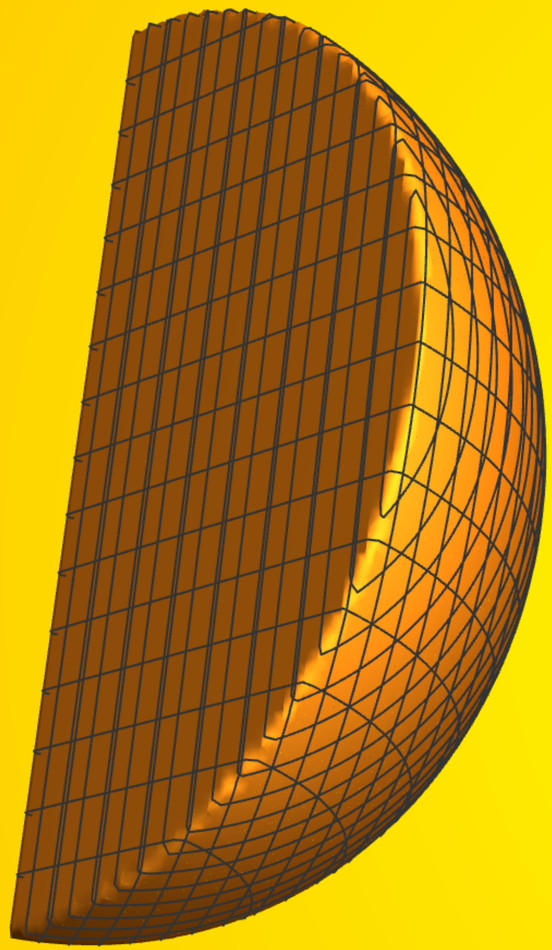
Muffin



$$\int_0^{2\pi}\int_0^{\pi/4}\int_1^3 f(x,y,z)\,\rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta$$

$$1 < x^2 + y^2 + z^2 < 9 \qquad x^2 + y^2 < z^2$$

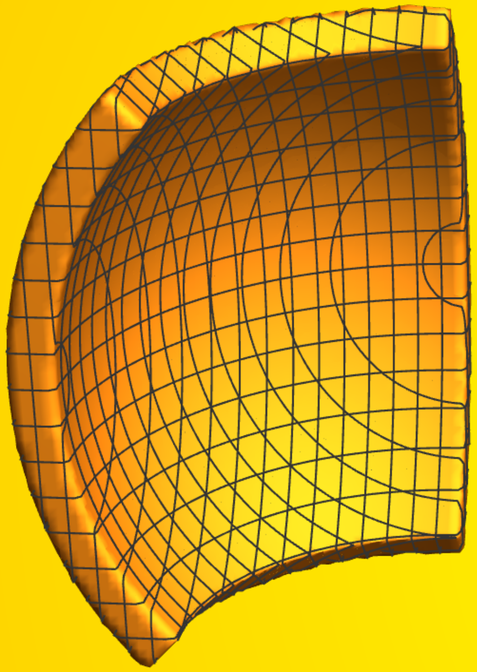
Cheese



$$\int_0^{\pi/3}\int_0^{\pi}\int_0^{2} f(x,y,z)\,\rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta$$

$$x^2+y^2+z^2<4, \quad 0<\theta<\frac{\pi}{3}$$

Orange Peel



$$\int_{\pi/2}^{\pi}\int_{\pi/4}^{3\pi/4}\int_{\sqrt{7}}^{3} f(x,y,z)\,\rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta$$

$$7 < x^2 + y^2 + z^2 < 9, \qquad \frac{\pi}{2} < \theta < \pi$$

$$x^2 + y^2 > z^2,$$

Worksheet

Homework due Wednesday

THE END