

Solution to Problem #1:

Spherical loaf of bread with radius R . The loaf is sliced at $y=a$ and $y=b$, where $0 < a < b < R$. What is the volume of the slice?

$$V = \int_a^b \int_{-\sqrt{R^2-y^2}}^{\sqrt{R^2-y^2}} \int_{-\sqrt{R^2-x^2-y^2}}^{\sqrt{R^2-x^2-y^2}} dz dx dy$$

$$V = 4 \int_a^b \int_0^{\sqrt{R^2-y^2}} \int_0^{\sqrt{R^2-y^2-z^2}} dx dz dy$$

$$V = \int_0^{2\pi} \int_a^b \int_0^{\sqrt{R^2-y^2}} r dr dy d\theta$$