

## 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?

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

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

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