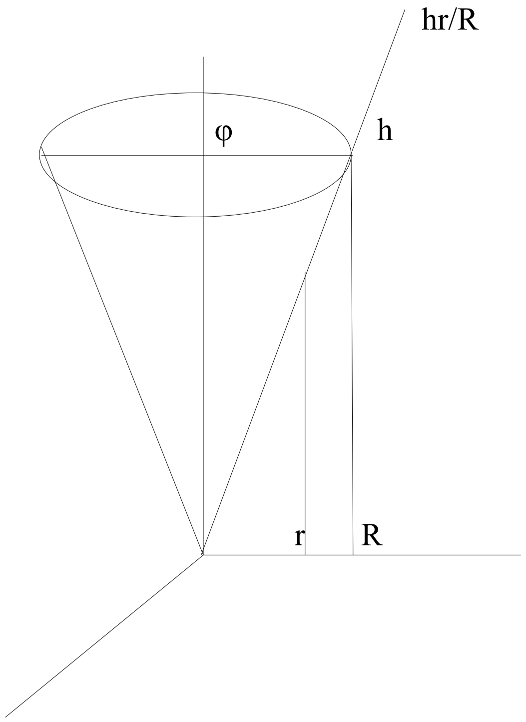
F2422 | Základní metody ve fyzice 2 | Petr Šafařík

F2422 – HW01 – 060113 | UČO: 175826



$$V = \int_{0}^{R} \int_{(0)}^{(2\pi)} \int_{(0)}^{(h - \frac{h}{R} * r)} r \, dh \, d\varphi \, dr$$

$$V = \int_{0}^{R} \int_{(0)}^{(2\pi)} hr - \frac{hr}{R} * r \, d\varphi \, dr$$

$$V = \int_{0}^{R} 2\pi hr - \frac{h}{R} * r^2 * 2\pi \, dr$$

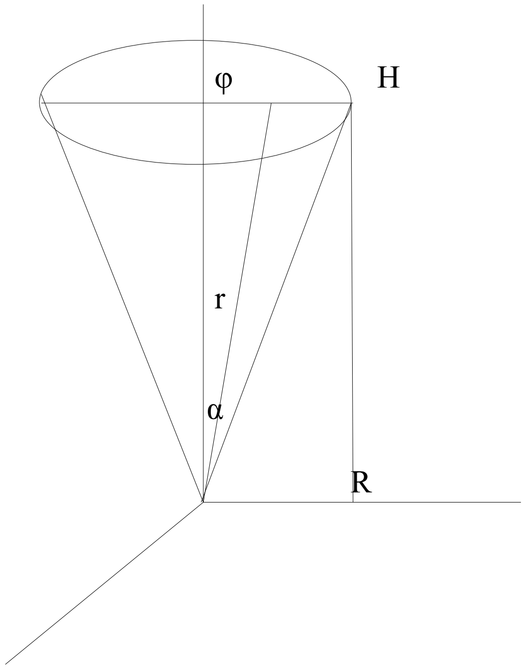
$$V = 2\pi * h \int_{0}^{R} (r - \frac{r^2}{R}) \, dr$$

$$V = 2\pi h (\frac{R^2}{2} - \frac{R^3}{3R})$$

$$V = 2\pi h (\frac{R^2}{2} - \frac{R^2}{3})$$

$$V = 2\pi h \frac{R^2}{6}$$

$$V = \frac{1}{3} \pi R^2 h$$



$$\varphi \in [0, 2\pi]$$
$$\alpha \in [0, \alpha]$$

$$\cos\alpha_1 = \frac{H}{r} \;\rightarrow\; r = \frac{H}{\cos\alpha_1}$$

$$V = \int_0^{2\pi} \int_0^{\alpha} \int_0^{\frac{h}{\cos\alpha_1}} (r^2 \sin\alpha)\, d\varphi\; d\alpha\; dr$$

$$V = \int_0^{2\pi} \int_0^{\alpha} \left(\frac{H^3}{3\cos^3\alpha_1} \sin\alpha\right) d\varphi\; d\alpha$$

$$V = \frac{H^3}{3} \int_0^{2\pi} \int_0^{\alpha} \left(\frac{\sin\alpha}{\cos^3\phi_1}\right) d\varphi\; d\alpha$$

$$V = \pi \frac{H^3}{3} \int_0^{2\pi} \left[\frac{-1}{2} \frac{1}{\cos^2\alpha}\right]_{\alpha}^{0} d\alpha$$

$$V = \pi \frac{H^3}{3} \int_0^{2\pi} \left(\frac{1}{\cos^2\alpha} - 1\right) d\alpha$$

$$V = \pi \frac{H^3}{3} \left(\frac{1 - \cos^2\alpha}{\cos^2\alpha}\right)$$

$$V=\pi\frac{H^3}{3}\left(\frac{1-\cos^2\alpha}{\cos^2\alpha}\right)$$

$$V=\pi\frac{H^3}{3}\left(\frac{\sin^2\alpha}{\cos^2\alpha}\right)$$

$$V=\pi\frac{H^3}{3}(\tan^2\alpha)$$

$$\tan\alpha=\frac{R}{H}$$

$$V=\frac{1}{3}\pi R^2 H$$

Kde

α je myšlena mez, čili maximum a α_1 je obecný úhel α