

Don n 4

Вариант 12

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N1

$$H = 250 \text{ км} = 25 \cdot 10^4 \text{ м}$$

$$m = 7 \text{ т} = 7 \cdot 10^3 \text{ кг}$$

$$R = 6380 \text{ км} = 638 \cdot 10^4 \text{ м}$$

$$g = 10 \frac{\text{м}}{\text{с}^2}$$

$$d = \int_R^{R+H} \frac{GmMdz}{r^2}$$

$$= GmM \int_R^{R+H} \frac{dz}{r^2}$$

$$mg = \frac{GmM}{R^2}$$

$$M = \frac{gR^2}{G}$$

$$\begin{aligned} d &= Gm \frac{gR^2}{G} \int_R^{R+H} \frac{dz}{r^2} = mgR^2 \int_R^{R+H} \frac{dz}{r^2} = \\ &= -\frac{mgR^2}{r} \Big|_R^{R+H} = -mgR^2 \left( \frac{1}{R+H} - \frac{1}{R} \right) = \\ &= -\frac{mgR^2(R-R-H)}{R(R+H)} = \frac{mgR^2H}{R+H} \end{aligned}$$

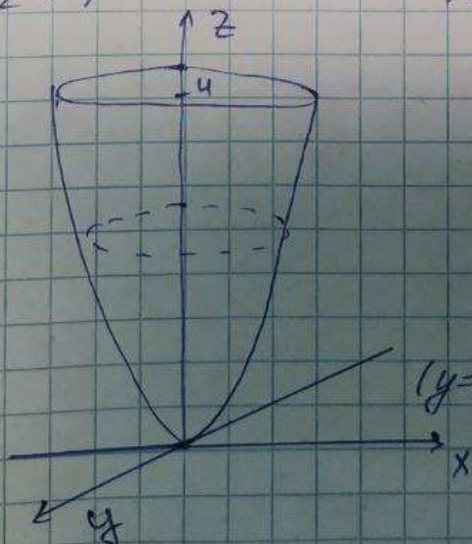
$$d = \frac{25 \cdot 10^4 \cdot 7 \cdot 10^3 \cdot 10 \cdot 638 \cdot 10^4}{638 \cdot 10^4 + 25 \cdot 10^4} = \frac{25 \cdot 7 \cdot 638 \cdot 10^8}{66.3}$$

$$= 168,401 \cdot 10^8 \text{ Дж} = 16840,1 \text{ МДж}$$

N2

$$z = 2x^2 + 8y^2$$

$$z = 4$$



В сечении параболоид  
плоскостью  $z = \text{const}$   
получается эллипс.

Найдем эллипса:

$$S = \pi ab$$

Найдем параметры:

$$\frac{2x^2}{z} + \frac{8y^2}{z} = 1$$

$$\sqrt{\frac{z}{2}}$$

$$(y=0) a = \sqrt{\frac{z}{2}}$$

$$(x=0) b = \sqrt{\frac{z}{8}}$$

Тогда получаем:

$$S = \pi ab = \pi \sqrt{\frac{z}{2}} \sqrt{\frac{z}{8}} = \frac{\pi z}{4}$$

$$V = \int_0^4 S(z) dz = \int_0^4 \frac{\pi z}{4} dz = \frac{\pi}{4} \int_0^4 z dz =$$

$$= \frac{\pi}{4} \frac{z^2}{2} \Big|_0^4 = \frac{\pi}{8} (16 - 0) = \frac{16\pi}{8} = 2\pi$$