

(1)

$$I = \int \sqrt{r^{2/3} - x^{2/3}} dx$$

$$x^{1/3} = r^{1/3} \sin t, \quad x = r \sin^3 t, \quad dx = 3r \sin^2 t \cos t dt$$

$$I = \int \sqrt{r^{2/3} - r^{2/3} \sin^2 t} \cdot 3r \sin^2 t \cos t dt =$$

$$= 3r \cdot r^{1/3} \int \cos^2 t \sin^2 t dt =$$

$$= 3r^{4/3} \int \frac{1}{2} (1 + \cos 2t) \frac{1}{2} (1 - \cos 2t) dt =$$

$$= \frac{3}{4} r^{4/3} \int (1 - \cos^2 2t) dt = \frac{3}{4} r^{4/3} \left[\int dt - \int \cos^2 2t dt \right] =$$

$$= \frac{3}{4} r^{4/3} \left[t - \frac{1}{2} \int (1 + \cos 4t) dt \right] = \frac{3}{4} r^{4/3} \left[t - \frac{1}{2} \int dt - \right.$$

$$\left. - \frac{1}{8} \int \cos 4t d4t \right] = \frac{3}{4} r^{4/3} \left[t - \frac{1}{2} t - \frac{1}{8} \sin 4t + c \right] =$$

$$= \frac{3}{4} r^{4/3} \left[\frac{1}{2} t - \frac{1}{8} \sin 4t + c \right] =$$

$$= \frac{3}{4} r^{4/3} \left[\frac{1}{2} \arcsin \sqrt{\frac{x}{r}} - \frac{1}{8} (4 \cos^3 \sin t - 4 \cos t \sin^3 t) + c \right] =$$

$$\sin t = \sqrt{\frac{x}{r}}; \quad \sin 4t = 4 \cos^3 \sin t - 4 \cos t \sin^3 t$$

$$\cos t = \sqrt{1 - \frac{x^{2/3}}{r^{2/3}}} = \frac{1}{r^{1/3}} \sqrt{r^{2/3} - x^{2/3}}$$

$$\sin t \cos t = \frac{x^{1/3}}{r^{1/3}} \cdot \frac{1}{r^{1/3}} \sqrt{r^{2/3} - x^{2/3}} = \frac{x^{1/3}}{r^{2/3}} \sqrt{r^{2/3} - x^{2/3}}$$

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$$\cos^2 t = \frac{1}{\Gamma^{2/3}} (\Gamma^{2/3} - x^{2/3}), \quad \sin^2 t = \frac{x^{2/3}}{\Gamma^{2/3}}$$

$$I = \frac{3}{8} \Gamma^{4/3} \left[\arcsin \sqrt{\frac{x}{\Gamma}} - \frac{x^{1/3}}{\Gamma^{2/3}} \sqrt{\Gamma^{2/3} - x^{2/3}} \left(\frac{1}{\Gamma^{2/3}} (\Gamma^{2/3} - x^{2/3}) - \frac{x^{2/3}}{\Gamma^{2/3}} \right) + C \right]$$

Дальше сам упрости.

А второй интеграл мне кажется было
дешево.