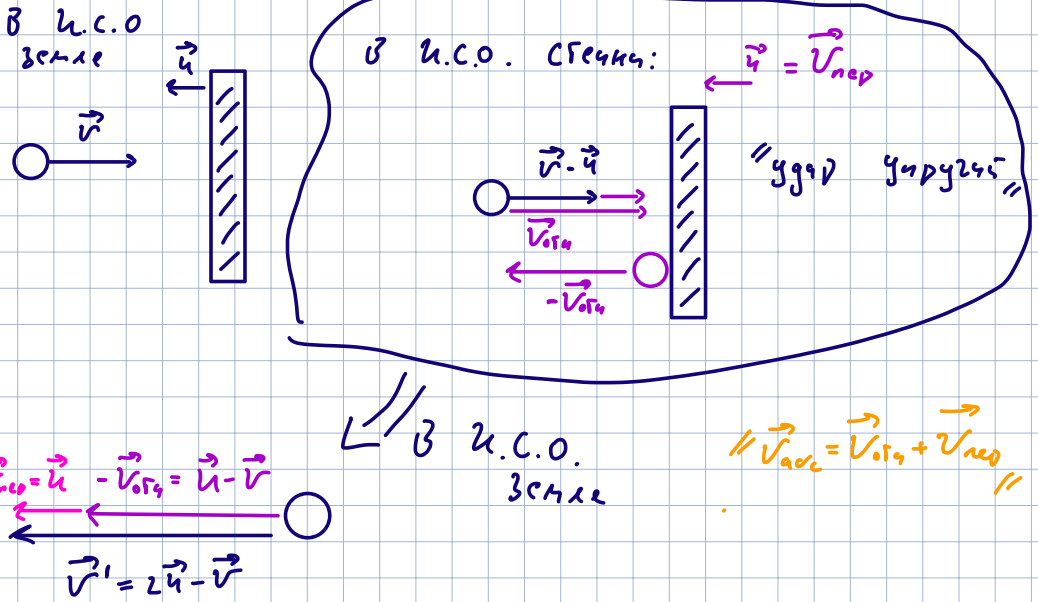
№ 4.70

v, u

$u < v$

$\Delta K, \Delta p$



До столкновения: $\vec{v}$

После столкновения: $2\vec{u} - \vec{v}$

1) $\Delta K = K_1 - K_0 = \frac{m}{2}(2u - v)^2 - \frac{m}{2}v^2$

$\Delta K = \frac{m}{2}(4u^2 - 4uv + v^2 - v^2)$

$\Delta K = 2m(u^2 - uv)$

$\Delta K = 2mu(u - v) < 0$

2) $\Delta p = m(2u - v) - mv = 2m(u - v) < 0$

3) $v' = 0 \Rightarrow 2u - v = 0$

$2u = v$

$\frac{u}{v} = \frac{1}{2}$

v2

$$V(r) = V_0 \cdot \left[\left(\frac{a}{r}\right)^{12} - \left(\frac{a}{r}\right)^{6} \right]$$

$$F(r) = \frac{dV}{dr} = V_0 \cdot \left[12 \cdot \left(\frac{a}{r}\right)^{11} \cdot \left(\frac{-a}{r^2}\right) - 6 \cdot \left(\frac{a}{r}\right)^{5} \cdot \left(-\frac{a}{r^2}\right) \right] = 0$$

$$F(r) = V_0 \left[6 \cdot \frac{a^6}{r^7} - 12 \cdot \frac{a^{12}}{r^{13}} \right]$$

$$F(r_0) = 0 \quad \Leftrightarrow \quad 6 \cdot \frac{a^6}{r_0^7} - 12 \cdot \frac{a^{12}}{r_0^{13}} = 0$$

$$\frac{a^6}{r_0^7} = 2 \cdot \frac{a^{12}}{r_0^{13}}$$

$$r_0^6 = 2\,a^6$$

$$r_0 = \sqrt[6]{2} \cdot a$$