Для нахождения функции уточнения импульса J нужно также найти интеграл $\int I_1 dt$

$$I_1 = v_2 \left(120 v_2^{(1)} \omega^2 \omega^{(1)} - 5 v_2^{(1)} \omega^{(3)} - 16 v_2 \omega^5 - 10 v_2^{(2)} \omega^{(2)} + 60 v_2 \omega \left(\omega^{(1)}\right)^2 - 10 v_2^{(3)} \omega^{(1)} + 40 v_2^{(2)} \omega^3 - 5 v_2^{(4)} \omega - v_2 \omega^{(4)} + 40 v_2 \omega^2 \omega^{(2)} \right)$$

Подставив $\omega = \frac{u}{v_2}$, получим

$$I_1 = \frac{u}{v_2^3} \left\{ 6 \dot{v}_2^4 - \underbrace{14 (\dot{v}_2)^2 \ddot{v}_2 v_2}_{б} + 20 (\dot{v}_2)^2 u^2 + 7 \underbrace{\dot{v}_2 v_2^2 v_2^{(3)}}_{c} + 4 (\ddot{v}_2)^2 v_2^2 - \underbrace{4 v_2^3 v_2^{(4)}}_{a} - 16 u^4 \right\}$$

a: $\int v_2^{(4)} dt = v_2^{(3)} \Big| = 0.$

б: $\int \frac{\dot{v}_2^2 \ddot{v}_2}{v_2^2} dt = \underbrace{\frac{\dot{v}_2^3}{v_2^2}\Big|_{v_m}^{\infty}}_{0} - \int \dot{v}_2 \left(\frac{2 \dot{v}_2 \ddot{v}_2}{v_2^2} - \frac{2 \dot{v}_2^3}{v_2^3} \right) dt$

$\quad = \frac{2}{3} \int \frac{\dot{v}_2^4}{v_2^3} dt.$

c: $\int \frac{\dot{v}_2 v_2^{(3)}}{v_2} = \underbrace{\frac{\dot{v}_2 \ddot{v}_2}{v_2}\Big|}_{0} - \int v_2^{(2)} \left(\frac{v_2^{(2)}}{v_2} - \frac{\dot{v}_2^2}{v_2^2} \right) = \int \frac{\dot{v}_2^2 \ddot{v}_2}{v_2^2} - \frac{\left(v_2^{(2)}\right)^2}{v_2}$

$$\int I_1 dt = \int \frac{u}{v_2^3} \left(\frac{4}{3} \dot{v}_2^4 + 20 \dot{v}_2^2 u^2 + 3 v_2^2 (\ddot{v}_2)^2 - 16 u^4 \right) dt = \qquad dt = \frac{dv_2}{\dot{v}_2}$$

$$= - \int_{v_{min}}^{\infty} \frac{u}{v_2^3} \left(\frac{4}{3} \dot{v}_2^4 + 20 \dot{v}_2^2 u^2 + 3 v_2^2 (\ddot{v}_2)^2 - 16 u^4 \right) \frac{dv_2}{\dot{v}_2} =$$

$$= \frac{2}{3} u \int_{v_m}^{\infty} \frac{25 v_2^2 u^4 + 28 u^4 v_2 + 82 v_2^{3/2} u^2 - 56 u^4 + 56 u^2 \sqrt{v_2} + 73 v_2}{v_2^3 \sqrt{u^2 v_2 + 2\sqrt{v_2} - u^2}} dv_2.$$