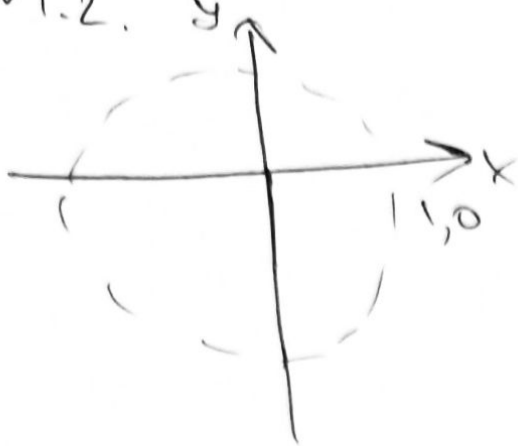
N1.2.




$(x, y) \to (r, \varphi)$

$$\begin{cases} r = 1 \\ \varphi_i \in [0; 2\pi) \end{cases} \longrightarrow \begin{cases} \varphi_1 \in [0; \varphi_2) \\ \varphi_2 \in [0; \varphi_3) \\ \varphi_3 \in [0; 2\pi) \end{cases}$$

пусть $\varphi_3 \geq \varphi_2 \geq \varphi_1$:

искомая длина дуги

$$\langle l \rangle = 2\pi - \langle \varphi_3 - \varphi_1 \rangle = 2\pi - \frac{A_3^3}{(2\pi)^3} \int_0^{2\pi} d\varphi_3 \int_0^{\varphi_3} d\varphi_2 \int_0^{\varphi_2} d\varphi_1 \cdot (\varphi_3 - \varphi_1) =$$

$$= 2\pi - \frac{3!}{(2\pi)^3} \int_0^{2\pi} d\varphi_3 \int_0^{\varphi_3} d\varphi_2 \left(\varphi_2\varphi_3 - \varphi_2^2/2\right) = 2\pi - \frac{3!}{4\pi^3} \int_0^{2\pi} d\varphi_3 \cdot \left(\varphi_3^3/2 - \right.$$

$$\left. - \frac{\varphi_3^3}{6}\right) = 2\pi - \frac{1}{4\pi^3} \frac{3}{3} \int_0^{2\pi} \varphi_3^3 \, d\varphi_3 = 2\pi - \frac{1}{4\pi^3} \cdot \frac{16\pi^4}{4} =$$

$$= 2\pi - \pi = \pi$$