N1.

$$0\varepsilon = \bar{v}$$

$$\Lambda_1 = \cos\frac{\alpha}{2} + \bar{v}\sin\frac{\alpha}{2}$$

$$\Lambda_2 = \cos\frac{\pi}{4} + i_1\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}(1+i_1)$$

$$\Lambda_3 = \cos\frac{\pi}{4} + i_2\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}(1+i_2)$$

$$\underline{\Lambda_3 \circ \Lambda_2 \circ \Lambda_1 = 1}$$

$$(1+i_2)\circ(1+i_1)\circ\left(\cos\frac{\alpha}{2} + \bar{v}\sin\frac{\alpha}{2}\right) = 2$$

$$(1 + \underbrace{i_1 + i_2 - i_3}_{\bar{\lambda}})\circ\left(\cos\frac{\alpha}{2} + \bar{v}\sin\frac{\alpha}{2}\right) =$$

$$= \cos\frac{\alpha}{2} + \bar{v}\sin\frac{\alpha}{2} + \bar{\lambda}\cos\frac{\alpha}{2} +$$

$$+ \sin\frac{\alpha}{2}[\bar{\lambda}, \bar{v}] - \sin\frac{\alpha}{2}(\bar{\lambda}, \bar{v})$$

$$= \cos\frac{\alpha}{2} - \sin\frac{\alpha}{2}(\bar{\lambda},\bar{v}) +$$

$$+ \bar{v}\sin\frac{\alpha}{2} + \bar{\lambda}\cos\frac{\alpha}{2} + \sin\frac{\alpha}{2}[\bar{\lambda},\bar{v}]$$

$$\cos\frac{\alpha}{2} - \sin\frac{\alpha}{2}(\bar{\lambda},\bar{v}) = 2$$

$$|c| \leq \sqrt{3}$$

$$\leq \sqrt{1+c^2} = 2$$

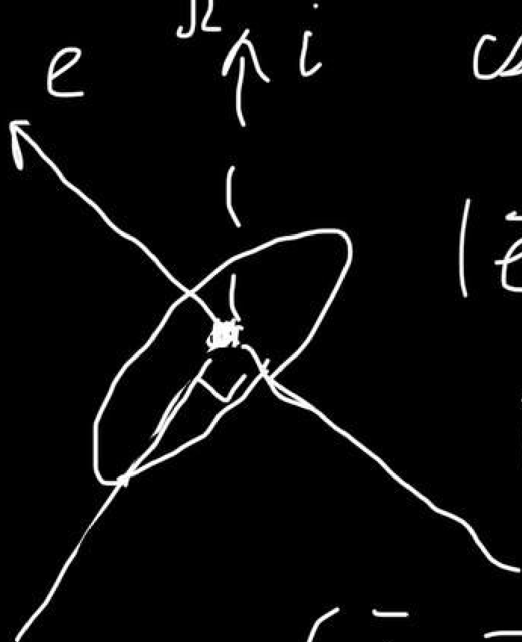
$$\text{"="} \Leftrightarrow \begin{cases} (\bar{\lambda},\bar{v}) = \pm\sqrt{3} \\ \alpha = \mp\frac{2\pi}{3} \end{cases}$$

$$O_\xi : \begin{cases} \bar{v} = (i_1 + i_2 - i_3)\dfrac{1}{\sqrt{3}} \\ \alpha = -\dfrac{2\pi}{3} \end{cases}$$

или

$$\begin{cases} \bar{v} = (i_1 + i_2 - i_3)\dfrac{-1}{\sqrt{3}} \\ \alpha = \dfrac{2\pi}{3} \end{cases}$$

№2.



$$\cos(\bar{e}, \bar{i}) = \text{const}$$

$$(\dot{\bar{e}}, \bar{i}) = 0$$

$$\dot{\bar{e}} = \bar{\omega} \times \bar{e}$$

$$(\bar{\omega}, \bar{e}, \bar{i}) = 0$$

$$\bar{\omega} = \bar{\omega}_1 + \bar{\omega}_2 = \underset{\Omega}{\underset{\parallel}{\omega_1}}\, i + \omega_2\, e$$

$$\Lambda_1 = \cos\frac{\varphi_1}{2} + e \sin\frac{\varphi_1}{2}$$

$$\varphi_1 = \int_0^t \omega_1\, dt = \Omega t$$

$$e(t) = \Lambda_1 \circ e \circ \bar{\Lambda}_1$$

$$\Lambda_2 = \cos\frac{\varphi_2}{2} + e(t)\sin\frac{\varphi_2}{2}$$

$$\varphi_2 = \int_0^t \omega_2\, dt$$

Тогда $\Lambda = \Lambda_1 \circ \Lambda_2 =$

$$= \left(\cos\frac{\Omega t}{2} + i\sin\frac{\Omega t}{2}\right) \circ \left(\cos\frac{\varphi_2}{2} + \Lambda_1 \circ e \circ \bar{\Lambda}_1 \sin\frac{\varphi_2}{2}\right)$$

Если $\varphi_2 \equiv 0$, то

$$\Lambda = \cos\frac{\Omega t}{2} + i\sin\frac{\Omega t}{2}.$$

$\nu^3.$

$$\dot{\lambda} = \omega \cdot \frac{\lambda}{2}$$

$$\lambda(t+dt) = \lambda(t) + \omega \cdot \frac{\lambda}{2}\, dt$$

$$\|\lambda(t+dt)\| = \left(\lambda + \omega \frac{\lambda}{2} dt\right) \cdot \left(\bar{\lambda} - \bar{\lambda}\frac{\omega dt}{2}\right)$$

$$= \lambda\bar{\lambda} + \frac{1}{2}\cancel{\omega\lambda\bar{\lambda}\,dt} -$$
$$- \frac{1}{2}\cancel{\lambda\bar{\lambda}\omega\,dt} - \frac{1}{4}\omega\lambda\bar{\lambda}\omega \underbrace{\cancel{(dt)^2}}_{0}$$

$$= \|\lambda(t)\|$$