(a) Using the rot/ref formulae,

$$\text{rot}_\alpha \text{ref}_\alpha \text{rot}_{-\alpha} = \text{rot}_\alpha \text{ref}_{\alpha-(-\alpha)}$$
$$= \text{rot}_\alpha \text{ref}_{2\alpha}$$
$$= \text{ref}_{\alpha+2\alpha}$$
$$= \text{ref}_{3\alpha}.$$

(b) Suppose that $\text{rot}_\alpha \text{ref}_\alpha \text{rot}_{-\alpha} = \text{ref}_\alpha$. Then, from part (a), $\text{ref}_{3\alpha} = \text{ref}_\alpha$. Hence 3α and α must differ by a multiple of 2π, i.e. $3\alpha = \alpha + 2n\pi$ for some $n \in \mathbb{Z}$. Hence $\alpha = n\pi$ for some $n \in \mathbb{Z}$, as required.

Now suppose that $\alpha = n\pi$ for some $n \in \mathbb{Z}$. Then, using (a),

$$\text{rot}_\alpha \text{ref}_\alpha \text{rot}_{-\alpha} = \text{ref}_{3\alpha} = \text{ref}_{3n\pi} = \text{ref}_{2n\pi + n\pi} = \text{ref}_{n\pi} = \text{ref}_\alpha,$$

as required.