④

$$+\frac{\Omega\varepsilon J}{16\pi}\Big(\frac{-4}{\Omega}\big(\cos(\Omega t+\pi)-\cos(\Omega t-\pi)\big)$$
$$-\frac{J}{2\Omega}\big(\sin(4\phi+2\Omega t+2\pi)-\sin(4\phi+2\Omega t-2\pi)\big)$$
$$+\frac{1}{\Omega}\big(\cos(2\phi+2\Omega t+2\pi)-\cos(2\phi+2\Omega t-2\pi)\big)\Big)$$

$$=J+\frac{\varepsilon J^2}{8}+\frac{\varepsilon J}{4}\sin 2\phi-\frac{\Omega J}{2}$$
$$+\frac{\Omega\varepsilon J}{16\pi}\Big(\frac{-4}{\Omega}(-\cos\Omega t--\cos\Omega t)-\frac{J}{2\Omega}\cdot 0$$
$$+\frac{1}{\Omega}\big(\cos(2\phi+2\Omega t)-\cos(2\phi+2\Omega t)\big)\Big)$$

$$=J+\frac{\varepsilon J^2}{8}+\frac{\varepsilon J}{4}\sin 2\phi-\frac{\Omega J}{2}$$ ✓

ie $\bar{K}(\phi,J)=J+\frac{\varepsilon J^2}{8}+\frac{\varepsilon J}{4}\sin 2\phi-\frac{\Omega J}{2}$

$$=\frac{\varepsilon}{4}\Big(\frac{4}{\varepsilon}\Big(J-\frac{\Omega J}{2}\Big)+J\sin 2\phi+\frac{J^2}{2}\Big)$$
$$=\frac{\varepsilon}{4}\Big(\frac{4}{\varepsilon}\Big(1-\frac{\Omega}{2}\Big)J+J\sin 2\phi+\frac{J^2}{2}\Big)$$
$$=\frac{\varepsilon}{4}\Big(\Big(\frac{4}{\varepsilon}\Big(1-\frac{\Omega}{2}\Big)+\sin 2\phi\Big)J+\frac{J^2}{2}\Big)$$

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Put $\frac{\varepsilon\gamma}{4}=1-\frac{\Omega}{2}$ ✓

$$\gamma=\frac{4}{\varepsilon}\Big(1-\frac{\Omega}{2}\Big)$$

Then $\bar{K}(\phi,J)=\frac{\varepsilon}{4}\Big((\gamma+\sin 2\phi)J+\frac{J^2}{2}\Big)$

$$\dot{\phi}=\frac{\partial\bar{K}}{\partial J}=\frac{\varepsilon}{4}\frac{\partial}{\partial J}\big((\gamma+\sin 2\phi)J+J^2/2\big)$$
$$=\frac{\varepsilon}{4}(\gamma+\sin 2\phi+J)$$ ✓

$$\dot{J}=-\frac{\partial\bar{K}}{\partial\phi}=\frac{-\varepsilon}{4}\frac{\partial}{\partial\phi}\big((\gamma+\sin 2\phi)J+J^2/2\big)$$
$$=\frac{-\varepsilon}{4}\cdot 2J\cos 2\phi=-\frac{\varepsilon J}{2}\cos 2\phi$$ ✓

At the fixed points $\dot{\phi}=\dot{J}=0$