

宇田雄一「古典物理学」

$$[2d] \lim_{\varepsilon \rightarrow +0} \varepsilon^2 \int_{\theta=0}^{\pi} \int_{\phi=0}^{2\pi} [[\sin(\theta)]^2 \cos(\phi) f(c_1(\xi, \theta, \phi, \varepsilon), 3, 1) \\ - [\sin(\theta)]^2 \sin(\phi) f(c_1(\xi, \theta, \phi, \varepsilon), 2, 1) \\ + \sin(\theta) \cos(\theta) f(c_1(\xi, \theta, \phi, \varepsilon), 1, 2)] = 0$$

$$[2e] \lim_{\varepsilon \rightarrow +0} \varepsilon^2 \int_{\theta=0}^{\pi} \int_{\phi=0}^{2\pi} [[\sin(\theta)]^2 \cos(\phi) f(c_2(\xi, \theta, \phi, \varepsilon), 1, 1) \\ - [\sin(\theta)]^2 \sin(\phi) f(c_2(\xi, \theta, \phi, \varepsilon), 3, 1) \\ + \sin(\theta) \cos(\theta) f(c_2(\xi, \theta, \phi, \varepsilon), 2, 2)] = 0$$

$$[2f] \lim_{\varepsilon \rightarrow +0} \varepsilon^2 \int_{\theta=0}^{\pi} \int_{\phi=0}^{2\pi} [[\sin(\theta)]^2 \cos(\phi) f(c_3(\xi, \theta, \phi, \varepsilon), 2, 1) \\ - [\sin(\theta)]^2 \sin(\phi) f(c_3(\xi, \theta, \phi, \varepsilon), 1, 1) \\ + \sin(\theta) \cos(\theta) f(c_3(\xi, \theta, \phi, \varepsilon), 3, 2)] = 0$$

$$[2g] \lim_{\varepsilon \rightarrow +0} \varepsilon^2 \int_{\theta=0}^{\pi} \int_{\phi=0}^{2\pi} [[\sin(\theta)]^2 \cos(\phi) f(c_4(\xi, \theta, \phi, \varepsilon), 1, 1) \\ + [\sin(\theta)]^2 \sin(\phi) f(c_4(\xi, \theta, \phi, \varepsilon), 2, 1) \\ + \sin(\theta) \cos(\theta) f(c_4(\xi, \theta, \phi, \varepsilon), 3, 1)]$$

$$= \sum_{k \in \mathbb{N}} q(k)$$

$$[2h] \lim_{\varepsilon \rightarrow +0} \varepsilon^2 \int_{\theta=0}^{\pi} \int_{\phi=0}^{2\pi} [[\sin(\theta)]^2 \cos(\phi) f(c_4(\xi, \theta, \phi, \varepsilon), 1, 2) \\ + [\sin(\theta)]^2 \sin(\phi) f(c_4(\xi, \theta, \phi, \varepsilon), 2, 2) \\ + \sin(\theta) \cos(\theta) f(c_4(\xi, \theta, \phi, \varepsilon), 3, 2)] = 0$$

ただし、

$$c_1(\xi, \theta, \phi, \varepsilon) \in \mathbb{R}(4)$$

$$[c_1(\xi, \theta, \phi, \varepsilon)](1) = \xi(1)$$

$$[c_1(\xi, \theta, \phi, \varepsilon)](2) = \xi(2) + \varepsilon \sin(\theta) \cos(\phi)$$

$$[c_1(\xi, \theta, \phi, \varepsilon)](3) = \xi(3) + \varepsilon \sin(\theta) \sin(\phi)$$

$$[c_1(\xi, \theta, \phi, \varepsilon)](4) = \xi(4) + \varepsilon \cos(\theta)$$