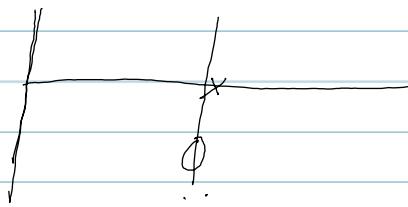


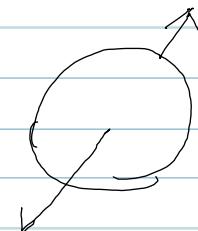
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假設地球有密度均勻的圓球。若地球半徑為 R_E 公尺，質量為 M_E 公斤。地球與太陽的平均距離為 R 公尺。
 (1) 地球自轉的轉動動能
 (2) 地球繞太陽公轉的轉動動能
 (3) 公轉的動能是自轉動能的幾倍？

$$K = \frac{1}{2} I \omega^2$$



$$\begin{aligned} (1) \quad K &= \frac{1}{2} \left(\frac{2}{5} M_E R_E^2 \right) \omega^2 \\ &= \frac{1}{5} M_E R_E^2 \left(\frac{2\pi}{86400} \right)^2 \\ &= \frac{4}{5} \pi^2 M_E R_E^2 \times \left(\frac{1}{86400} \right)^2 \end{aligned}$$



$$M_E = 5.98 \times 10^{24} \text{ 公斤} \quad = 2.57 \times 10^{29} \text{ (焦耳)}$$

$$R_E = 6.38 \times 10^6 \text{ 公尺}$$

$$\begin{aligned} (2) \quad K' &= \frac{1}{2} (M_E R)^2 \omega^2 \\ &= \frac{1}{2} (M_E R^2) \left(\frac{2\pi}{365 \times 86400} \right)^2 \\ &= 2\pi^2 M_E R^2 \left(\frac{1}{365 \times 86400} \right)^2 = 2.6678 \times 10^{33} \text{ (焦耳)} \end{aligned}$$

$$R = 1.5 \times 10^{11} \text{ 公尺}$$

$$(3) \quad \frac{K'}{K} = \frac{2.6678 \times 10^{33}}{2.57 \times 10^{29}} = 1.037 \times 10^4$$