2022年9月30日. 第四周第2次课.

微振动

人 → 非线性方程. → 可能不能求解;

eg: $U = a/r$

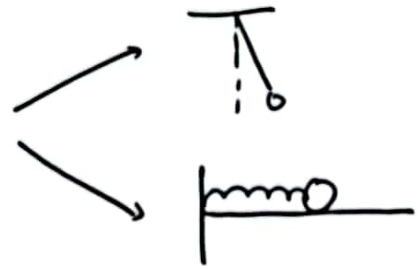
生活经验 ⇒ 简单 → 振动.

⇓

单摆;

Chap. 5

① 单摆.

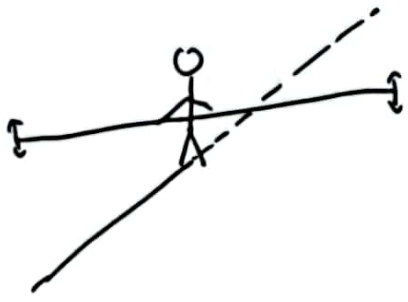


② 阻尼.

③ 驱动.

④ 共振.

⑤ 杂技



⑥ 应用. 研究分子光谱;

①

$$m\ddot{x} = f = -k(x-x_0)$$

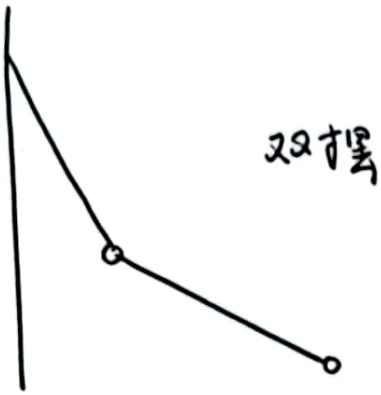
$$x - x_0 = A\cos(\omega t + \theta)$$

$$m\omega^2 = k$$

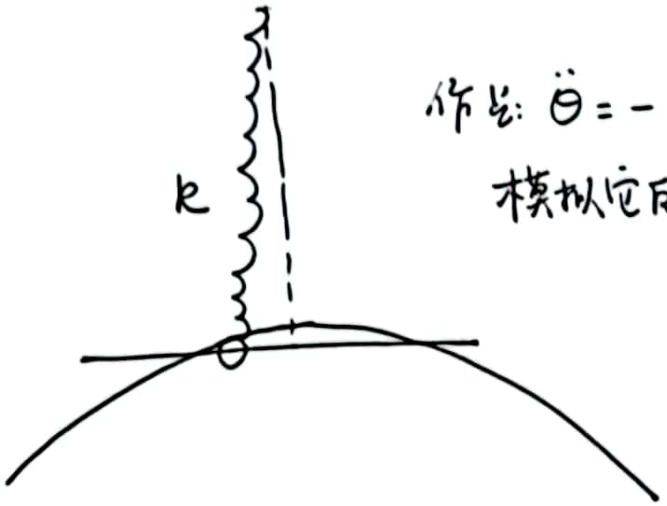
$$m\ddot{x} = f = -\frac{\partial U(x)}{\partial x}$$

$$U(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4$$

②

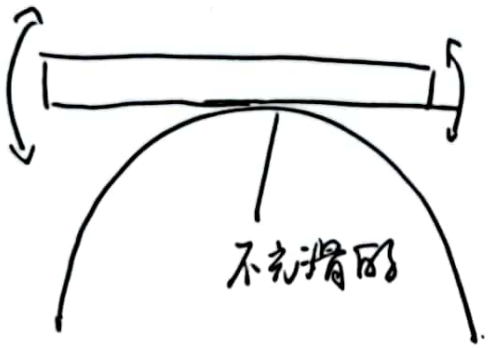


双摆



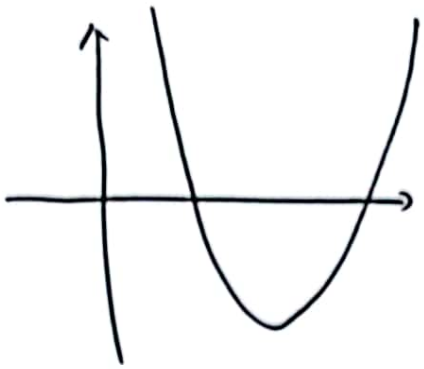
作业: $\ddot{\theta} = -\theta^3$

模拟它的动作



(计算周期)

$(X-X_0)^2+(X-X_0)^3+(X-X_0)^4+eFx$



(5) $(x-X_0)^2+eFx$

$$2(x-X_0)+eF=0.$$

$$x = X_0+\frac{-eF}{2}$$

$$= X_0-\frac{eF}{2}$$

$$(\cdots)(X-X_0')^2$$

$$\Delta E = E_1-E_0$$

$$= \hbar\omega(Fe)$$

文献：

PRB. 105. 094421 (2022)

PRE. 105. 054204 (2022)

用 MMA 推导文章公式.