

# 《数值计算方法》板书

补充讲： ① 梯度下降算法  
(优化)

② 偏微分方程.

$$\sum_{i=1}^n i = \frac{1}{2} n(n+1) \quad \text{高斯}$$

---

$$\frac{dy}{dx} = f(x, y) \quad \text{常微分方程}$$

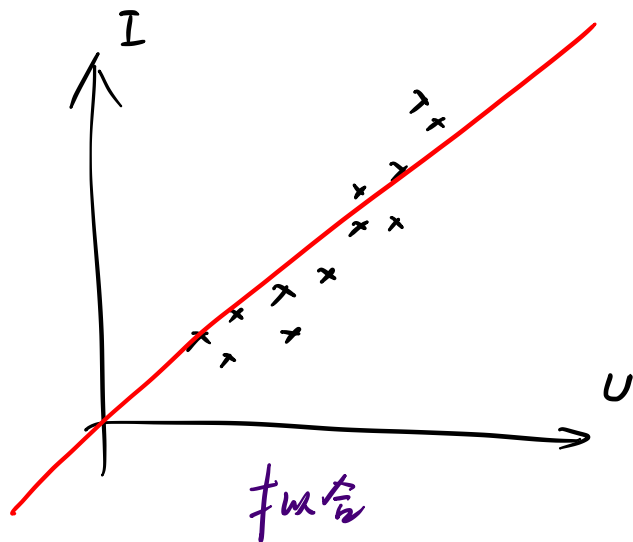
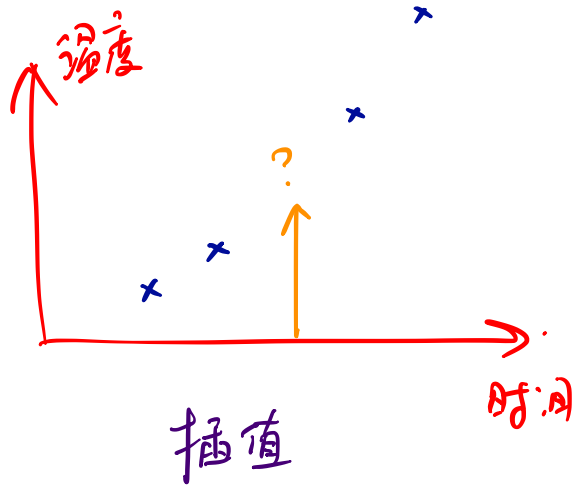
$$\frac{dy}{dx} = x \Rightarrow y = \frac{1}{2} x^2 + C$$

$$x=0 \text{ 时. } y=0 \Rightarrow C=0$$

$$Ax = y$$

(Red arrows: one points to  $x$  with the character "求" (find), one points to  $y$  with the character "已知" (known), and one points to  $A$ )

线性方程组



$(0.5)_{10}$  的二进制

$(0.1)_2$

$(0.3)_{10}$  的二进制

32位 = 二进制表示浮点数

$(0.01001\dots)_2$

$\begin{matrix} \uparrow & \uparrow & \uparrow \\ \frac{1}{8} & \frac{1}{16} & \frac{1}{32} \end{matrix}$

$0.05$

$0.125$

$0.0625$

$0.03125$

float  $x = 1.0 / 3.0;$

if ( $\text{fabs}(x * 3.0 - 1) < 1e-10$ )

浮点数的  
判断

---

$$H = 6.0 \pm 0.2 \quad D = 5.0 \pm 0.1$$

$$V = \frac{\pi}{4} D^2 H$$

$$V^* = \frac{\pi}{4} \times 5^2 \times 6$$

$$V - V^* = \frac{\partial V}{\partial H} \cdot (H - H^*) + \left(\frac{\partial V}{\partial D}\right) (D - D^*)$$

$$= \frac{\pi}{4} D^2 (\pm 0.2) + \frac{\pi}{2} D H (\pm 0.1)$$

$$e_r = \frac{V - V^*}{V} = \dots$$

大数  
的小数

$$x = 50324.$$

5位浮点小数  
5位指数.

$$y = 0.37621$$

$$x = 5.0324 \times 10^4$$

+

$$y = 3.7621 \times 10^{-1}$$

$$z = x + y = \underline{5.032437621} \times 10^{+4}$$

$$\rightarrow 5.0324 \times 10^4$$

相接近的两数相减

$$\begin{aligned} x &= \underline{3.7426} \times 10^4 \\ y &= \underline{3.7423} \times 10^4 \end{aligned} \quad \begin{aligned} &\longrightarrow \\ &\longrightarrow \end{aligned}$$

相对误差

$$\varepsilon_r \approx 10^{-4}$$

$$\begin{aligned} x - y &= 0.0003 \times 10^4 \\ &= 3 \end{aligned}$$

$$\varepsilon_r \approx \frac{1}{10}$$





