## 微分方程问题的求解

## 微分方程介绍:

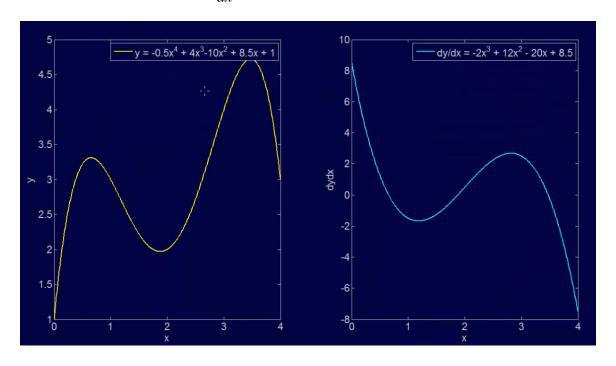
- 1. *x*自变量
- 2. y因变量

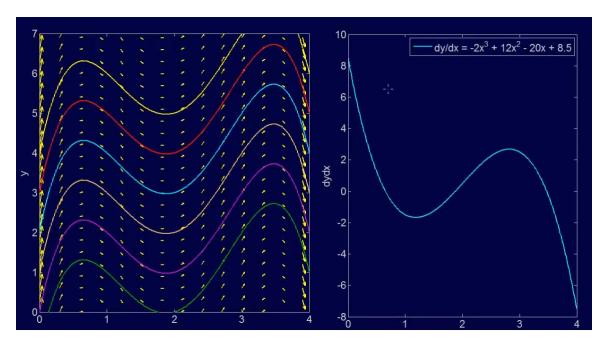
举例:

$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 1$$
 (1.1)

则

$$\frac{dy}{dx} = -2x^3 + 12x^2 - 20x + 8.5\tag{1.2}$$





Slope Field
$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 4$$

$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 3$$

$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 2$$

$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 1$$

$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 0$$

$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x - 1$$

$$\frac{dy}{dx} = f(x) \tag{1.3}$$

$$\frac{dy}{dx} = f\left(x, y\right) \tag{1.4}$$

## 龙格-库塔法(Runge-Kutta Method)

$$\frac{dy}{dx} = f\left(x, y\right) \tag{1.5}$$

$$y_{i+1} = y_i + \phi h {(1.6)}$$

$$\int_{y_i}^{y_{i+1}} dy = \int_{x_i}^{x_{i+1}} f(x, y) dx$$
 (1.7)

$$y_{i+1} - y_i = \int_{x_i}^{x_{i+1}} f(x, y) dx$$
 (1.8)

$$y_{i+1} = y_i + \int_{x_i}^{x_{i+1}} f(x, y) dx$$
 (1.9)

## 欧拉法(Euler's Method)

$$y_{i+1} = y_i + \phi h {(1.10)}$$

$$\phi = f(x, y) \tag{1.11}$$

$$y_{i+1} = y_i + f(x, y) h$$
 (1.12)