微分方程问题的求解

微分方程介绍：

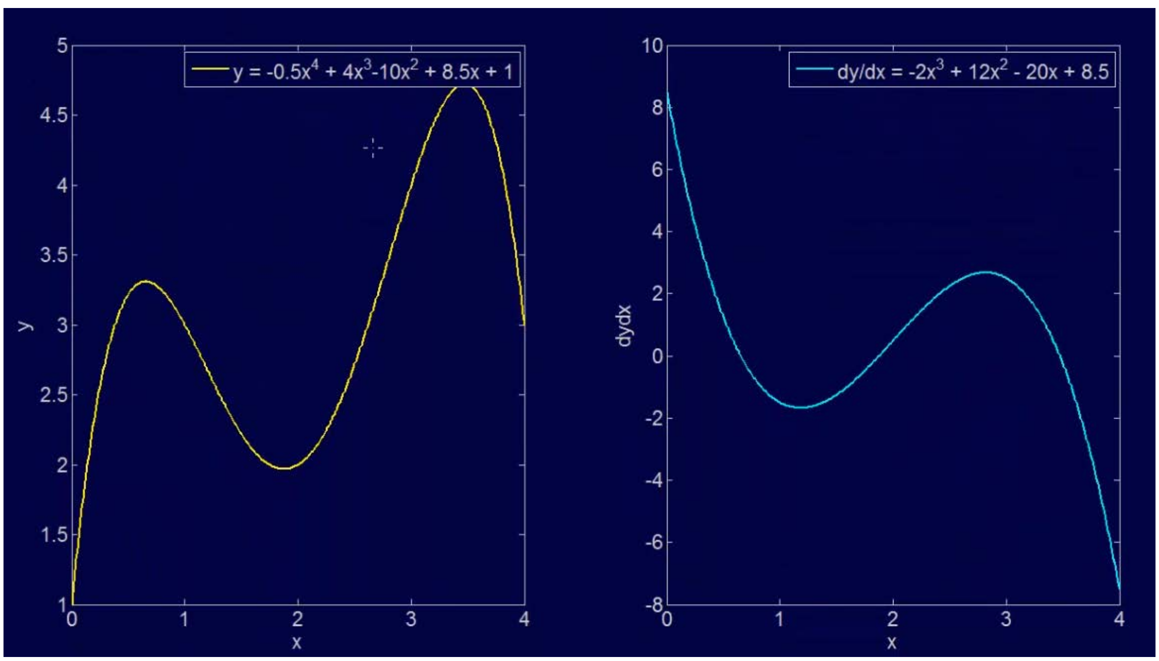
1. x自变量
2. y因变量

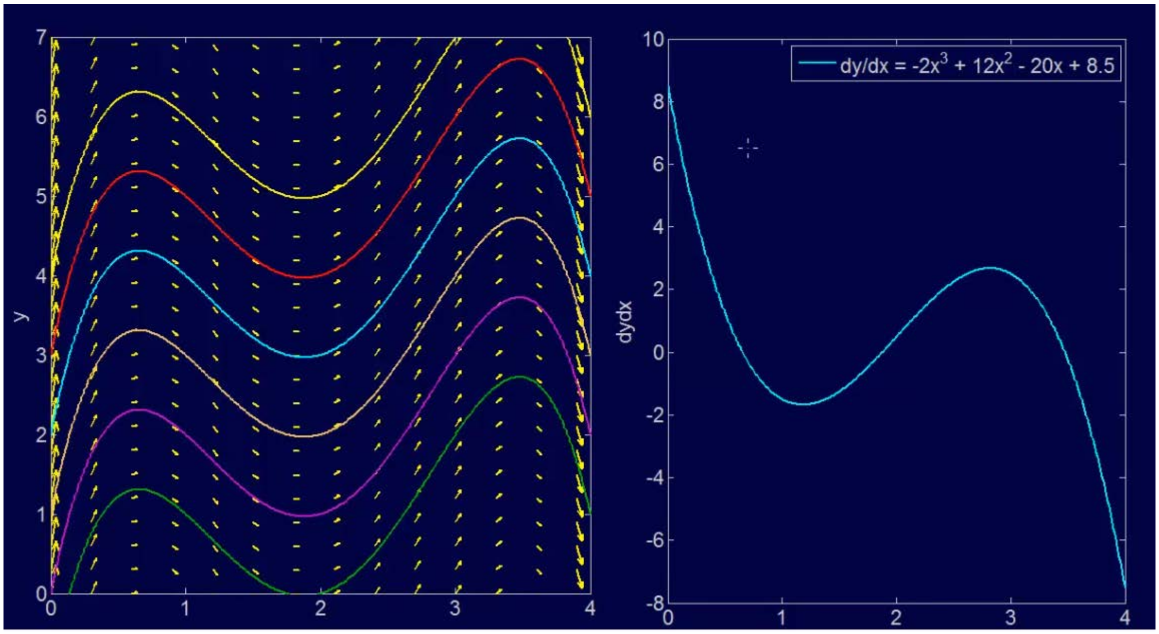
举例：

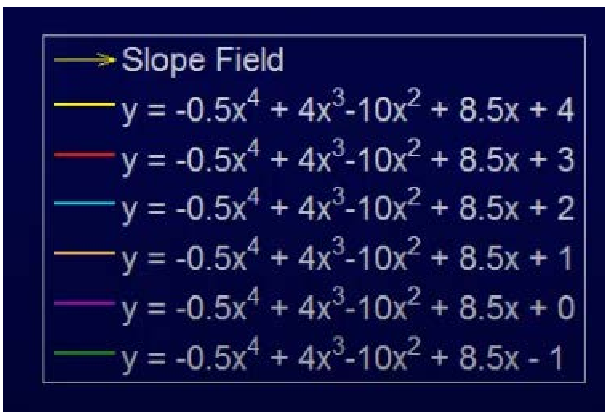
$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 1 \tag{1.1}$$

则

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







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

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

龙格-库塔法（Runge-Kutta Method）

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

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

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

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

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

欧拉法（Euler’s Method）

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

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

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