

## Summary on the Principle of Superposition

**Principle of Superposition.** Consider the nonhomogeneous equation

$$a(x)y'' + b(x)y' + c(x)y = g_1(x) + g_2(x) + \cdots + g_m(x). \quad (1)$$

- If  $y_{pi}$  is a **particular** solution of the equation

$$a(x)y'' + b(x)y' + c(x)y = g_i(x), \quad i = 1, 2, \dots, m,$$

then a **particular** solution of (1) is given by

$$y_p(x) = y_{p1}(x) + y_{p2}(x) + \cdots + y_{pm}(x).$$

- If  $y_1$  and  $y_2$  are two linearly independent solutions of the homogeneous equation

$$a(x)y'' + b(x)y' + c(x)y = 0,$$

then a **general** solution of (1) is given by

$$y(x) = c_1y_1(x) + c_2y_2(x) + y_{p1}(x) + y_{p2}(x) + \cdots + y_{pm}(x).$$