

Nonhomogeneous Linear Equations

$$y'' + p(x)y' + q(x)y = r(x) \quad (1)$$

$$y'' + p(x)y' + q(x)y = 0 \quad (2)$$

Theorem The difference of two solutions of (1) is a solution of (2). The sum of a solution of (1) and a solution of (2) is a solution of (1).

General solution of (1) is a solution of the form $y = y_h + y_p$, where $y_h = c_1y_1 + c_2y_2$ is a general solution of (2) and y_p is any solution of (1).

To solve the nonhomogeneous equation (1), we have to solve the homogeneous equation (2) and find one particular solution of (1).