

Second-Order Linear equations

General form $A(x)y'' + B(x)y' + C(x)y = F(x)$

As usual, $y' = \frac{dy}{dx}$ $y'' = \frac{d^2y}{dx^2}$

e.g. $x^2y'' + \sin(x)y' + 13x^3y = e^x$

Second-order because we have y''
Linear because y, y', y'' appear to first power only.

Note $y'' = yy'$ is not linear, because to things involving y are multiplied together.

Homogeneous versus Non-homogeneous

Nonhomogeneous: $A(x)y'' + B(x)y' + C(x)y = F(x)$
is the general case

Homogeneous
is when the right-hand side
is zero: $A(x)y'' + B(x)y' + C(x)y = 0$

Example: $y'' + 3y' + 2y = e^x \leftarrow$ Nonhomogeneous

$y'' + 3y' + 2y = 0 \leftarrow$ Homogeneous version.

["Homogeneous" = every term involves y'', y' , or y .]