Engineering Analysis & Numerical Methods

ii- Non-Homogenous 2nd Order D.E.

when $R(x) \neq 0$

1- Assume $R(x) = 0$ and find y_h

2- Find y_p by → method of undetermined coeff.
→ variation of parameters.

3- Let $y = y_h + y_p$

[a] Method of undetermined coefficients:-

$ay'' + by' + cy = F(x)$

i- assuming y_p

ii- substituting y_p into the given diff-eq.

iii- determining the arbitrary constants in y_p.

R(x)	y_p	R(x)	y_p (example)
K	A	2	A
Kx^n	$Ax^n + Bx^{n-1} + \dots + C$	$3x^2$	$Ax^2 + Bx + C$
Ke^{rx}	Ae^{rx}	$3e^{2x}$	Ae^{rx}
$K\cos rx$	$A\cos rx + B\sin rx$	$2\cos 2x$	$A\cos 2x + B\sin 2x$
$K\sin rx$		$3x^2 + \cos 2x$	$Ax^2 + Bx + C + D\cos 2x + E\sin 2x$
		$3xe^{2x}$	$(Ax^2 + Bx + C)e^{2x}$