Assignment-1

Solve the following differential equations.

(1) $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = \sin 2x$

(2) $\frac{d^4y}{dx^4} - y = x^4$

(3) $(D^3 - 3D^2 + 4D - 2)y = e^x + \cos x$

(4) $(D^2 - 4D + 4)y = e^{2x} + x^3 + \cos 2x$

(5) $y'' + y' - 2y = -6\sin 2x - 18\cos 2x$, $y(0) = 2$, $y'(0) = 2$

(6) $(D^2 - 4D + 3)y = 2xe^{3x} + 3e^{3x}\cos 2x$.

(7) $\frac{d^3y}{dx^3} - 2\frac{dy}{dx} + 4y = e^x \cos x$.

(8) $(D^2 - 1)y = x\sin x + e^x + x^2e^x$

(9) $y'' - 2y + y = xe^x \sin x$

(10) $x^2y'' + xy' + y = \log x \sin(\log x)$

(11) $(x^2D^2 + 1)y = 3x^2$

(12) $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = x^2 + \sin(5\log x)$

(13) $(2x+1)^2y'' - 2(2x+1)y' - 12y = 6x$

Solve the following simultaneous differential equation —

(14) $\frac{dx}{dt} - y = t$, $\frac{dy}{dt} = t^2 - x$.

(15) $\frac{dx}{dt} + 2y + \sin t = 0$

$\frac{dy}{dt} - 2x - \cos t = 0$

Solve the following differential equation—

(16) $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$, given $y = x$ is a part of C.F.

(17) $x^2y'' + xy' - y = 0$

(18) $\frac{d^2y}{dx^2} - \frac{2}{x}\frac{dy}{dx} + \left(1 + \frac{2}{x^2}\right)y = 0$

(19) $y'' - 4xy' + (4x^2 - 3)y = e^{x^2}$

(20) $x\frac{d^2y}{dx^2} - \frac{dy}{dx} - 4x^3y = 8x^3\sin x^2$

(21) $\cos x\, y'' + \sin x\, y' - \cos^3 x\, y = 2\cos^5 x$

Solve the following differential equation using method of variation of parameters.

(22) $y'' + y = \operatorname{cosec} x$

(23) $\frac{d^2y}{dx^2} - y = \left(1 + \frac{1}{e^x}\right)^{-2}$

(24) $y'' + y = (x - \cot x)$

(25) $(D^2 + 2D + 1)y = 4e^{-x}\log x$

(26) $x^2y'' + xy' - y = x^2e^x$

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