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15/ENG05/017

Civil Engineering

ENG 381

Assignment 2

(1) $y = e^{x^2+x}$

$y'' = y'(2x+1) + 2y$

$\frac{dy}{dx} = (2x+1)e^{x^2+x}$

$y'' = (2x+1)(2x+1)e^{x^2+x} + 2e^{x^2+x}$

$= e^{x^2+x}[(2x+1)^2 + 2]$

$\therefore y'' = y'(2x+1) + 2y$

(2) $y'' = y'(2x+1) + 2y$

$y'' - y'(2x+1) - 2y = 0$

$W = y''$

$V = 1, \quad V' = 0$

$u = y' \quad u^n = y^{n+1}$

$W^n = u^n V + n u^{n-1} V'$

$= y^{n+1} + 0$

$W = -y'(2x+1)$

$V = 2x+1, \quad V' = 2, \quad V'' = 0$

$u = -y' \quad u^n = -y^{n+1}$

$W^n = u^n V + n u^{n-1} V' + \frac{n(n-1)}{2!} u^{n-2} V''$

$= -y^{n+1}(2x+1) + n(-y^{n+1}) \cdot (2) + 0$

$= -y^{n+1}(2x+1) + 2n(-y^n)$

$W = -2y$

$V = -2 \quad V = 0$

$u = y \quad W^n = y^n$

$W^n = u^n V + n u^{n-1} V'$

$= y^n \cdot 2 + 0 = -2y^n$

$\therefore y^n = y^{n+1} - y^{n+1}(2x+1) + 2n(-y^n) - 2y^n$

$y^{n+2} - y^{n+1}(2x+1) + 2n(-y^n) - 2y^n = 0$

$y^{n+2} - y^{n+1}(2x+1) - 2y^n(n+1) = 0$

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$y^{n+2} = y^{(n+1)}(2n+1) + 2y^{n}(n+1)$

⑥ $y = x^3 e^{4x}$ 15-7

$u = x^3, v' = 3x^2, v'' = 6x, v''' = 6, v'''' = 0$

$u = e^{4x}, u' = 4e^{4x}, u'' = 16e^{4x}, u''' = 64e^{4x}, u'''' = 256e^{4x}$

$u^{v} = 1024e^{4x}$

$\therefore y^{n} = u^{n}v + n u^{n-1}v' + \frac{n(n-1)}{2!}u^{n-2}v^2 + \frac{n(n-1)(n-2)}{3!}v^3 u^{n-3} + \frac{n(n-1)(n-2)(n-3)}{4!}u^{n-4}u^4$

$y^{5} = 1024e^{4x}(x^3) + 15x^2(256e^{4x}) + 60x(64e^{4x}) + 60(16e^{4x})$

$y^{5} = 64e^{4x}(16x^3 + 60x^2 + 60x + 15)$

⑦ $x^2y'' + xy' + y = 0$

$W = xc^2y''$

$V = xc^2, V' = 2xc, V'' = 2$

$u = y''; y^{n} = y^{n+2}$

$W^{n} = uV + n y^{n-1}V' + \frac{n(n-1)}{2!}y^{n-2}v^2 + \frac{n(n-1)(n-2)}{3!}u^{n-3}v^3$

$W^{n} = x^2y^{n+2} + n y^{n+1} - 2x + \frac{n(n-1)}{2!}y^{n} + 0$

$W^{n} = xy^{n+1} + ny^{n}$; $W = Y, V = 1, U = Y, V' = 0, U^{n} = y^{n}$

$W^{n} = xy^{n+1} + ny^{n}$, $W = Y, V = 1, U = Y, V' = 0$ $U^{n} = y^{n}$

$y^{n} = xc^2y^{(n+2)} + (2n+1)^{(n+1)} + (n^2+1)y^{n} = 0$