Assignment owole victor.
16/15NG03/026
Chem. Engr

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

For $y'' \Rightarrow y^{(n+2)} + ny^{(n+1)} \cdot 0$

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

For $y'(2x+1)$

For $2y \Rightarrow 2y^n$

∴ we have;

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

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

2; $y = x^3 e^{4x}$

$u = e^{4x}, u' = 4e^{4x}, u'' = 16e^{4x}, u''' = 64e^{4x}, u^{(4)} = 256e^{4x}$ $u^{(5)} = 1024e^{4x}$

$v = x^3, v' = 3x^2, v'' = 6x, v''' = 6, v^{(4)} = 0$

$y^{(5)} = u^{(5)}v + 5u^{(4)}v^{(1)} + 10u^{(3)}v^{(2)} + 10u^{(2)}v^{(3)} + 5u^{(1)}v^{(4)} + uv^{(5)}$

$y^{(5)} = 1024e^{4x} \cdot x^3 + [5(256e^{4x} \cdot 3x^2)] + [10(64e^{4x} \cdot 6x)] + [10(16e^{4x} \cdot 0)] +$

$[5(4e^{4x} \cdot 0)] + 0$

$y^{(5)} = 1024e^{4x} \cdot x^3 + 3840e^{4x} + 3840^{4x} \cdot x + 960e^{4x}$

$\Rightarrow e^{4x}(1024x^3 + 3840x^2 + 3840x + 960)$

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

i. $x^2\frac{dy}{dx^2} + x\frac{dy}{dx} + y = 0$

$\Rightarrow x^2y'' + xy' + y = 0$

using Leibnitz

from x^2y'', ~~y=y~~ $u = y''$, $x^2 = v$

$x^2y'' = {}^nC_0 u^{(n)} v + {}^nC_1 u^{(n-1)} v^{(1)} + {}^nC_2 u^{(n-2)} v^{(2)}$

$\Rightarrow y^{(n+2)} x^2 + n y^{(n+1)} \cdot 2x + \frac{n(n-1)}{2!} y \cdot 2$

$x^2y'' \Rightarrow y^{(n+2)} \cdot x^2 + 2xny^{(n+1)} + n(n-1)y^{(n)}$

For xy', $u = y'$ and $v = x$

$xy' = y^{(n+1)} x + ny^{(n)}$

For $y \Rightarrow y^{(n)}$

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

$y^{(n+2)} x^2 + xy^{(n+1)} (2n+1) + y^{(n)} [n(n-1)(n+1)]$

$y^{(n+2)} x^2 + xy^{(n+1)} (2n+1) + y^{(n)} [n(n^2-1)]$

$\Rightarrow x^2 y^{(n+2)} + xy^{(n+1)} (2n+1) + y^{(n)} (n^3 - n)$