IYAGBA THELMA

15/ENG04/033

ELECT/ELECT ENG

ENG 381

Assignment 3

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

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

$y'' = \frac{d^2y}{dx^2} = e^{x^2+x}.(2) + (2x+1)(2x+1)e^{x^2+x})$

~~$= 2e^{x^2+x} + 4x^2+4x+1(e^{x^2+x})$~~

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

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

$w_1 \quad w_2 \quad w_3$

$w_1 = y^2$

$u = y^2 \quad v = 1$

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

$w_2 = y'(2x+1)$

$u = y' \qquad v = (2x+1)$

$u^n = y^{(n+1)} \qquad v' = 2$

$u^{(n-1)} = y^{(n)}$

$w_3 = 2y$

$u = y \quad v = 2$

$u^n = y^{(n)}$

$w_1 = w_2 + w_3 \quad \left[y^n = u^{(n)}v + n u^{(n-1)}v' \right.$

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

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

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

2.) $y = x^3 e^{4x}$

$u = e^{4x} \qquad v = x^3$

$u^n = 4^n e^{4x} \qquad v' = 3x^2$

$u^{(n-1)} = 4^{(n-1)} e^{4x} \qquad v^2 = 6x$

$u^{(n-2)} = 4^{(n-2)} e^{4x} \qquad v^3 = 6$

$u^{(n-3)} = 4^{(n-3)} e^{4x}$

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

$y^5 = 4^5 e^{4x} \cdot x^3 + 5(4^{(5-1)} e^{4x}) \cdot 3x^2 + \frac{5(5-1)}{2!}(4^{(5-2)} e^{4x}) 6x + \frac{5(5-1)(5-2)}{3!}(4^{(5-3)} e^{4x}) 6$

~~$y^5 = 20x^3 e^{4x} +$~~

$y^5 = 1024 e^{4x} x^3 + 3840 x^2 e^{4x} + 3840 x e^{4x} + 960 e^{4x}$

$y^5 = 1024 x^3 e^{4x} + 3840 x^2 e^{4x} + 3840 x e^{4x} + 980 e^{4x}$

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

2ii.) $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$

$\underbrace{x^2y^2}_{w_1} + \underbrace{xy'}_{w_2} + \underbrace{y}_{w_3} = 0$

$w_1 = x^2y^2$

$u = x^2y^2 \quad u = y^2 \quad v = x^2$

$u^n = y^{(n+2)} \quad v' = 2x$

$u^{(n-1)} = y^{(n+1)} \quad v^2 = 2$

$u^{(n-2)} = y^{(n)}$

$w_2 = xy'$

$u = y' \quad v = x$

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

$u^{(n-1)} = y^{(n)}$

$w_3 = y$

$u = y \quad v = 1$

$u^n = y^n$

$w_1 + w_2 + w_3 \quad \left[y^n = u^n \cdot v + n u^{(n-1)} v' + \frac{n(n-1)}{2!} u^{(n-2)} v^2 \right.$

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

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

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

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

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

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