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17/ENG02/019
COMPUTER ENGINEERING
ENG 381: ASSIGNMENT $\underline{II}$

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

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

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

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

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

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

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

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

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

$a = y''$; $a' = y'''$, $a^n = y^{2+n}$

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

$u = y'$, $u^n = y^{n+1}$

$V = 2x+1$

$V' = 2$

$V'' = 0$

~~$B^n = (y^n +$~~

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

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

$c = 2y$

$c^n = 2y^n$

$a^n = B^n + c^n$

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

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

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

2. $y = x^3 e^{4x}$. determine y^5

Let $u = e^{4x}$, $v = x^3$

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

$v' = 3x^2$, $v'' = 6x$, $v''' = 6$, $v^{iv} = 0$

Using Leibnitz theorem

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

$$4^{(n-3)} e^{4x} \times 6 + c$$

$$y^n = 4^n e^{4x} x x^3 * 3x^2 n + 4^{(n-1)} e^{4x} + 3n(n-1) \times 4^{n-2} e^{4x} \times x + n(n-1)(n-2) \times 4^{(n-3)} e^{4x}$$

$$y^5 = 4^5 e^{4x} x^3 * 3x^2(5) + 4^{(5-1)} e^{4x} + 3(5)(5-1) \times 4^{(5-2)} e^{4x} \times x + 5(5-1)(5-2) 4^{5-3} e^{4x}$$

$$y^5 = 1024 e^{4x} x^3 * 15x^2 + 4^4 e^{4x} + 15(4) \times 4^3 e^{4x} \times x + 5(4)(3) 4^2 e^{4x}$$

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

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

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

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

$$\left(\frac{\partial^2 y}{dx^2}\right)^n = \frac{\partial^{n+2} y}{\partial x^{n+2}}$$

$$\left(\frac{\partial^2 y}{\partial x^2}\right)^{n-2} = y^n$$

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

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

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