15/ENG04/005

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Elect/Elect Engr.

ENG 381 ASSIGNMENT.

Question 1

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

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

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

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

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

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

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

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

$y^{11} = y^1(2x+1)+2y$

$w_1 \quad w_2 \quad w_3$

w_2

$U = y^1 \qquad v = 2x+1$

$U^n = y^{n+1} \qquad v^1 = 2$

$U^{n-1} = y^n \qquad v^{11} = 0$

w_1

$U = y^2$

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

w_3

$U = y \qquad v = 2$

$U^n = y^n \qquad v = 0$

$= U^n + w_3$

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

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

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

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

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

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

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

$= 4^n e^{4x} x^3 + n4^{(n-1)} e^{4x} \cdot 3x^2 + \frac{n(n-1)}{2!} 4^{(n-1)} e^{4x} \cdot 6x + \frac{n(n-1)(n-2)}{3!} 4^{n-2} e^{4x} \cdot 6$

$n = 5$

$= 4^5 e^{4x} x^3 + 5 4^4 e^{4x} \cdot 3x^2 + 10 4^3 e^{4x} \cdot 6x + 10 4^2 e^{4x} \cdot 6$

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

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

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

$w_1 \quad w_2 \quad w_3$

w_1

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

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

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

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

w_2

$u = y^{(1)}$ $\quad v = x$

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

$u^{n-1} = y^n$ $\quad v'' = 0$

w_3

$u = y$

$u^n = y^n$

$w_1 + w_2 + w_3$

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

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

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

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

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

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