15ENG07010

BATTA MASTALINAS

Petroleum Engineering

① $y = e^{x^2+x}$

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

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

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

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

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

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

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

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

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

w_1 w_2 w_3

w_1

$u = y^n$

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

w_2

$u = y'$ $v = 2x+1$

$u^n = y^{n+1}$, $v' = 2$

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

⑥ $y = x^3 e^{4x}$

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

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

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

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

$u^{n-3} = 4^{(n-3)} e^{4x}$ $\quad V^{iv} = 0$

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

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

$n = 5$

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

⑨ $x^2 d^2y/dx^2 + x\, dy/dx + y = 0$

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

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

$\omega_1 \quad \omega_2 \quad \omega_3$

ω_1

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

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

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

$u^{(n-2)} = y^{(n)}$ $\quad V''' = 0$

w.r

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

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

$u^{(n+1)} = y^{(n)}$ $\quad v'' = 0$

w.r

$u = y$

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

$w_1 + w_2 + w_3$

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

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

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

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

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

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