ASSIGNMENT 3

[illegible] [illegible]
16/ENG04/058
Elect/Elect

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

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

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

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

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

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

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

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

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

$w_1 \quad w_2 \quad w_3$

w_1

$v = y'$

$v^n = y^{(n+1)}$

w_2

$u = y \quad v = 2x+1$

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

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

w_3

$u = y \quad v = 2$

$u^n = y^n \quad v' = 0$

$w_1 = w_2 + w_3$

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

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

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

2. $y = x^3 e^{ax}$

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

$u^n = a^n e^{ax} \quad v^{(1)} = 3x^2$

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

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

$u^{n-3} = a^{n-3}e^{ax}$

$= a^n e^{ax} x^3 + na^{(n-1)} e^{ax} 3x^2 + \frac{n(n-1)}{2!}$

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

$e^{ax} 6$

$n = 5$

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

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

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

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

$w_1 \quad w_2 \quad w_3$

w_1

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

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

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

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

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

$u = y$

$u^n = y^n$

$w_1 + w_2 + w_3$

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

$\cdot x + ny^n + y^n = 0$

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

$+ ny^n + y^n = 0$

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

$+ ny^n + y^n$

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

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

$n(n-1) + n + 1)$

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