ANUSA OLUWATOBI. O
13/ENG06/C008
MECHANICAL ENGR
ENG 381 HW

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

$v = x^2 + x$

$dv/dx = 2x + 1$

$y = e^v$

$dy/dx = e^v$

~~$dy/dx = dy/dv \times dv/dx$~~

$= e^v \times 2x + 1$

$2x + 1 e^v \quad v = x^2 + x$

$dy/dx = 2x + 1 e^{x^2+x}$

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

$d^2y/dx^2 = 2e^{2x+x} + 4x^2 + 4x + 1 + e^{2x+x}$

$y'' = d^2y/dx^2 \quad y' \neq dy/dx \quad y = e^{x^2+x}$

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

$y'' = 2e^{2x+x} + 4x^2 + 4x + 1e^{2x+x}$

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

$= 4x^2 + 4x + 1e^{2x+x}$

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

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

$= 2e^{2x+x} + 4x^2 + 4x + 1e^{x^2+x}$

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

$\downarrow \quad \vee \quad \downarrow$

$W_1 \quad W_2 \quad W_2$

W_1

$V = y'' \qquad Y = 1$

$V^n = y^{n+2} \qquad V = 0$

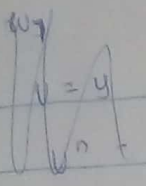
$= y^{n+2} - 1 + 0$

W_2

$V = y' \qquad Y = 2x + 1$

$V^n = y^{n+1} \qquad V = 0$

$(2[y^n - 1] + 0]$



$w_1 = w_2 + w_3$

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

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

2a) Using the Leibnitz theorem

$y = x^3 e^{4x}$ for $y^{(5)}$

Soln

$y^{(5)} = U^{(5)}V + 5U^4V^1 + 10U^3V^{11} + 10U^2V^3 + 5UV^4 +$

$= 4^5 e^{4x} \cdot x^3 + 5(4^4 e^{4x} \cdot 3x^2) + 10(4^3 e^{4x} 6x) + 5(4^3 e^{4x} \cdot 6) + 0$

$= 1024 e^{4x} x^3 + 1280 e^{4x} 3x^2 + 640 e^{4x} \cdot 6x + 80 e^{4x} \cdot 6$

$= 1024 e^{4x} x^3 + 3840 e^{4x} x^2 + 3840 e^{4x} x + 480 e^{4x}$

3)

~~$x^2 dy^2/dx^2 + x dy/dx + y = 0$~~

$x^2 y^{11} + xy^1 + y = 0$

$w_1 \quad w_2 \quad w_3$

For w_1

$U = y^{11} \qquad V = x^2$

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

$U^{n-1} = y^{n+1} \qquad V^{11} = 2$

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

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

For w_2

$w = y^1 \qquad U = x$

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

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

$= y^{n+1} \cdot x + n y^n + 0$

For w_2

$U = y \qquad v = 1$

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

$= y^n$

$$w_1 + w_2 + w_3 = 0$$

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

$$x y^{n+2} + 2n x y^{n+1} + x y^{n+1} + n^2 y^n - \cancel{n y^n + n y^n} + y^n$$

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