NAME: Ademilua Oyinkansola Course: ENG 381 Matric No:16/ENG04/005

Name: Ademilua Oyinkansola Oyinkansola.

Course: ENG 381.

Matric No: 16/ENG04/005.

1. $y = x^3 e^{4x}$

$y = uv$

$u = e^{4x}$ $u' = 4e^{4x}$ $u'' = 16e^{4x}$ $u''' = 64e^{4x}$.

$v = x^3$ $v' = 3x^2$ $v'' = 6x$ $v''' = 6$.

$y^{(5)} = u^{(5)}v + 5u^{(4)}v^{(1)} + 10u^{(3)}v^{(2)} + 10u^{(2)}v^{(3)} + 5u^{(1)}$
$v^{(4)} + uv^{(5)}$.

$y^5 = 1024e^{4x}.x^3 + 5.256e^{4x}.3x^2 + 10.64e^{4x}.6x + 10.16e^{4x}$
$.6 + 5.4e^{4x}.0 + e^{4x}.0$.

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

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

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

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

$x^2y'' + xy' + y = 0$.

Differentiating n times using Leibnitz theorem x^2y''

taking $u = y''$ and $v = x^2$

$x^2y'' = {}^nC_0\, u^{(n)}v + {}^nC_1\, u^{(n-1)}v^{(1)} + {}^nC_2\, u^{(n-2)}v^2$

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

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

xy'

taking $u = y'$ and $v = x$

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

$y^{n+1}x + ny^{(n)} + 0$.

$y = y^{(n)}$

Adding all the terms.

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

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

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

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

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

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

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

$y'(2x+1)$ taking $u = y'$ and $v = 2x+1$

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

$2y = 2y^n + 0$

Adding all terms

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

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