$y^5 = 1024x^3e^{4x} + 15(256)x^2e^{4x} + 15(4)(64)xe^{4x} + 5(4)(3)(16)e^{4x} + 0$

$\therefore y^5 = 1024x^3e^{4x} + 3840x^2e^{4x} + 3840e^{4x} \ldots + 960^{4x} + 0.$

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

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

Solution.

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

$x^2y'' + xy' + y = 0$. Taking $a_1 = x^2y''$ $a_2 = xy'$ $a_3 = y$

a_1

$u = y''$ $V = x^2$

$u^{(n)} = y^{n+2}$ $V' = 2x$

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

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

a_2

$u = y'$ $V = x$

$u^n = y^{(n+1)}$ $V' = 1$

$u^{(n-1)} = y^n$ $V'' = 0$

a_3

$u = y$ $V = 1$

$u^n = y^n$ $V = 0$

$y^n = u^{(n)}V + nu^{(n-1)}V' + \frac{n(n-1)u^{(n-2)}}{2!}V'' + \frac{n(n-1)(n-2)u^{(n-3)}}{3!}V''' + \frac{n(n-1)(n-2)(n-3)u^{(n-4)}}{4!}V'''' + \ldots$

(ABUAD), The Road to Intellectualism, Quality and Excellence