Mon Tue Wed Thu Fri Sat Sun

Date:

Solve by power Series

$$y'' + xy = 0$$

$P_0(x) = 1$

$P_1(x) = 0$

$P_2(x) = x$

standard form

$$P_0(x)\frac{d^2y}{dx^2} + P_1(x)\frac{dy}{dx} + P_2(x)y = 0$$

we get at point $x = 0$

$$P_0(x) = 1$$

$$P_0(0) = 1 \quad \neq 0$$

we will use Power Series so solution will be

$$y = \sum_{n=0}^{\infty} a_n x^n$$

$$\frac{dy}{dx} = \sum_{n=1}^{\infty} a_n n x^{n-1}$$

$$\frac{d^2y}{dx^2} = \sum_{n=2}^{\infty} n(n-1)a_n x^{n-2}$$

Put the values

$$\sum_{n=2}^{\infty} n(n-1)a_n x^{n-2} + x\left(\sum_{n=0}^{\infty} a_n x^n\right) = 0$$

$$\sum_{n=2}^{\infty} n(n-1)a_n x^{n-2} + \sum_{n=0}^{\infty} a_n x^{n+1} = 0$$

$$\sum_{n=0}^{\infty} (n+2)(n+1)a_{n+2} x^n + \sum_{n=1}^{\infty} a_{n-1} x^n = 0$$

$$2a_2 + \sum_{n=1}^{\infty} (n+2)(n+1)a_{n+2} x^n + \sum_{n=1}^{\infty} a_{n-1} x^n = 0$$

HERO PREMIUM

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$$2a_2 + \sum_{n=1}^{\infty} (n+2)(n+1)a_{n+2} x^n + \sum_{n=1}^{\infty} a_{n-1} x^n = 0$$

$$2a_2 = 0$$

$$a_2 = 0$$

$$(n+2)(n+1)a_{n+2} + a_{n-1} = 0$$

$$(n+2)(n+1)\, a_{n+2} = -a_{n-1}$$

$$a_{n+2} = -\frac{1}{(n+2)(n+1)} a_{n-1}$$

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