Mon Tue Wed Thu Fri Sat Sun

Date:

Bassel Equation

$$2x(1-x)y'' + (1-x)y' + 3y = 0$$

$P_0(x) = 2x(1-x)$, $P_1(x) = (1-x)$, $P_2(x) = 3$

$P_0(x) = 0 \Rightarrow 2x(1-x) = 0 \Rightarrow x = 0, 1$ [singular Points]

$P_0(x) = 2x(1-x) \Rightarrow P_0(0) = 2(0)(1-0) \Rightarrow P_0(0) = 0$ Finite/Analytic

Let [Frobenius Series Method)

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

$\sum_{n=0}$ n will not be affected b/c of "m"

$$\frac{dy}{dx} = y' = \sum_{n=0}^{\infty} (m+n) a_n x^{m+n-1}$$

$$\frac{d^2y}{dx^2} = y'' = \sum_{n=0}^{\infty} (m+n)(m+n-1) a_n x^{m+n-2}$$

Put values in Equation

$$2x(1-x)y'' + (1-x)y' + 3y = 0$$

$$(2x-2x^2)y'' + (1-x)y' + 3y = 0$$

$$(2x-2x^2)\sum_{n=0}^{\infty}(m+n)(m+n-1)a_n x^{m+n-2} + (1-x)\sum_{n=0}^{\infty}(m+n)a_n x^{m+n-1} + 3\sum_{n=0}^{\infty} a_n x^{m+n} = 0$$

$$2\sum_{n=0}^{\infty}(m+n)(m+n-1)a_n x^{m+n-1} - 2\sum_{n=0}^{\infty}(m+n)(m+n-1)a_n x^{m+n} + \sum_{n=0}^{\infty}(m+n)a_n x^{m+n-1} - \sum_{n=0}^{\infty}(m+n)a_n x^{m+n} + 3\sum_{n=0}^{\infty} a_n x^{m+n} = 0$$

$$2\sum_{n=0}^{\infty}(m+n+1)(m+n)a_{n+1} x^{m+n} - 2\sum_{n=0}^{\infty}(m+n)(m+n-1)a_n x^{m+n} + \sum_{n=0}^{\infty}(m+n+1)a_{n+1} x^{m+n} - \sum_{n=0}^{\infty}(m+n)a_n x^{m+n} + 3\sum_{n=0}^{\infty} a_n x^{m+n} = 0$$

Comparing Coefficients

$$2(m+n+1)(m+n)a_{n+1} - 2(m+n)(m+n-1)a_n + (m+n+1)a_{n+1} - (m+n)a_n + 3a_n = 0$$

$$[2(m+n+1)(m+n) + (m+n+1)]a_{n+1} = 2(m+n)(m+n-1)a_n + (m+n)a_n - 3a_n$$

$$a_{n+1} = \frac{[2(m+n)(m+n-1) + (m+n) - 3]}{[2(m+n+1)(m+n) + (m+n+1)]} a_n$$

HERO PREMIUM