

Math. 204

Homework Assignment No. (5)

Due date: 26-5-2008

Q1:

Use the power series method to solve the initial value problem

$$(x + 1)y'' - (2 - x)y' + y = 0, \quad y(0) = 2, \quad y'(0) = -1.$$

Q2:

Use the power series method to solve the differential equation

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

Q3:

(a) Find the Fourier series of the function

$$\begin{aligned} f(x) &= x + \pi, \quad -\pi < x < \pi, \\ f(x + 2\pi) &= f(x) \quad \text{for all } x \in \mathbb{R}. \end{aligned}$$

(b) Use the result of part (a) to show that

$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \sum_{n=1}^{\infty} \frac{(-1)^n}{(2n+1)}.$$

Q4:

Expand the following function in Fourier series

$$f(x) = |\cos x|, \quad -\pi < x < \pi.$$