Legendre functions

A collection of points from different sources

Manjunatha M R

December 31, 2023

Contents

Part I.

Book: Higher transcendental functions, by Harry Bateman

1. introduction

1.1.

The expansion of $(a^2 - 2arcos(\gamma) + r^2)^{-\frac{1}{2}}$ in powers of r contains the coefficients in terms of $cos(\gamma)$. These coefficients are polynomials of $cos(\gamma)$. These were first introduced in 1784 by Legendre and are known as Legendre polynomials. The expression $(a^2 - 2arcos(\gamma) + r^2)$ is dealing the potential at a point P of a source at the point A. Here r and a are the distances of P and A from O (Origin) respectively.

2. Solution of Legendre Differential equations

2.1. Legendre functions and differential equations

Definition 2.1.1 (Legendre's differential equation)**.** *A differential equation of the form*

$$(1-z^2)\frac{d^2\omega}{dz^2} - 2z\frac{dw}{dz} + [\nu(\nu+1) - \frac{\mu^2}{(1-z)^2}]\omega = 0,$$

where ν,μ and z are unrestricted(Complex numbers)

Definition 2.1.2 (Legendre functions)**.** *The Legendre functions are solutions of Legendre's differential equation.*

Part II.

Book: Asymptotic and special functions, by F.W.J Olver

Index