Date
20/08/2020

Assignment 3 (MA31007)

(Mathematical Methods)

Q1) Show that $\int_0^t J_0\left[x(t-x)\right]^{1/2} dx = 2\sin(t/2)$.

Q2) Use the generating function to prove that

$$J_n(x+y) = \sum_{m=-\infty}^{\infty} J_m(x)\, J_{n-m}(y).$$

Q3) Show that

$${}_2F_1(a-1, b-1; c; x) - F(a, b-1; c; x)$$

$$= \left(\frac{x}{c}\right) \times (1-b)\, {}_2F_1(a, b; c+1; x).$$

Q4) Find the solution of the following equations.

(i) $x(1-x)y'' + (3/2 - 2x)y' + 2y = 0$, about $x = 0$.

(ii) $(x-x^2)y'' + (3/2 - 2x)y' - (1/4) = 0$ about $x = 0$.

Q5) Solve the Legendre equation

$$(1-x^2)\frac{d^2y}{dx^2} - 2x\left(\frac{dy}{dx}\right) + n(n+1)y = 0,$$

by changing it to a hypergeometric eqn.

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