Date
20/08/2020

Assignment 2 (MA31007)

(Mathematical Methods)

Q1) Prove that (i) $J_0' = -J_1$

(ii) $J_2 - J_0 = 2J_0''$.

(iii) $J_2 = J_0'' - \left(\frac{1}{x}\right) J_0'$.

Q2) Prove that $J_{n+1}(x) = x \int_0^1 J_n(xy)\, y^{n+1}\, dy$.

Q3) Evaluate $\int J_3(x)\, dx$ and express the result in terms of J_0 & J_1.

Q4) Prove that —

(i) $\frac{d}{dx}\left[J_0(x)\right] = -J_1(x)$.

(ii) $\int_a^b J_0(x) J_1(x)\, dx = \frac{1}{2}\left[J_0^2(a) - J_0^2(b)\right]$

Q5) If $a > 0$, prove that

$$\int_0^\infty e^{-ax} J_0(bx)\, dx = \frac{1}{\sqrt{a^2+b^2}}.$$

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