Date
08/10/2021

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) $\frac{d}{dx}\{J_0(x)\} = -J_1(x)$.

(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 →

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

— x —