

Answer of Mid Term for Mathematic 2B

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(1) For Legendre polynomial P_m Prove that $\int_{-1}^1 x P_m(x) P_{m-1}(x) dx = \frac{2m}{4m^2 - 1}$

(2) Use generating function for Legendre polynomial to show that

$$P_{2m}(0) = (-1)^m \frac{(2m)!}{2^{2m} (m!)^2} \text{ and } P_{2m+1}(0) = 0$$

(3) For the Bessel Function $J_m(x)$ show that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$.

(4) Use the relation $J_{n-1}(x) + J_{n+1}(x) = \frac{2n}{x} J_n(x)$ to find $J_{3/2}(x)$ and $J_{-3/2}(x)$.

Answer