1. Consider the recurrence relation \( a_n = -4a_{n-1} + 3a_{n-2} + 18a_{n-3}, \ n \geq 3. \)
   (a) \([3 \text{ marks}]\) Write the corresponding characteristic equation, then find all its roots.
   (b) \([2 \text{ marks}]\) Show that the particular solution of the recurrence relation subject to
   the initial conditions \(a_0 = 0, \ a_1 = 2\) and \(a_2 = 13\) is
   \[a_n = (n - 1)(-3)^n + 2^n.\]
   (c) \([3 \text{ marks}]\) Find a closed form of the generating function \(G(z)\) of the sequence \(a_n\)
   given in part (b)