SC205- Discrete Mathematics

Home Work 8

Tutorial Discussion Week: March 23, 2020

(1) Is the sequence $\{a_n\}$ a solution of the recurrence relation $a_n = 8a_{n-1} - 16a_{n-2}$ if $a_n = 0?, a_n = 1?, a_n = 2^n?, a_n = 4n?, a_n = n4^n?a_n = n^2 4^n?$

(2) Suppose that the number of bacteria in a colony triples every hour. Set up a recurrence relation for the number of bacteria after n hours have elapsed. If 100 bacteria are used to begin a new colony, how many bacteria will be in the colony in 10 hours?

(3) Determine which of these are linear homogeneous recurrence relations with constant coefficients. Also find the degree of those that are.

$$a_n = 3a_{n-1} + 4a_{n-2} + 5a_{n-3}, a_n = a_{n-1} + n, a_n = a_{n-1}^2 + a_{n-2},$$
$$a_n = a_{n-1} + 2, a_n = \frac{a_{n-1}}{n}, a_n = a_{n-1} + a_{n-4},$$
$$a_n = a_{n-2}, a_n = 3, a_n = 3a_{n-2}$$

(4) The Lucas number satisfy the recurrence relation $L_n = L_{n-1} + L_{n-2}$ and the initial conditions $L_0 = 2$ and $L_1 = 1$. Find the explicit formula for the Lucas number.

(5) Find the solution to $a_n = 7a_{n-2} + 6a_{n-3}$, with $a_0 = 9, a_1 = 10$ and $a_2 = 32$.

(6) Consider an equation $a_n = 3a_{n-1} + 2^n$. Show that $a_n = -2^{n+1}$ is a solution of this recurrence relation. Using an appropriate theorem find all solutions of this recurrence relation. Find the solution with $a_0 = 1$.