Nathan Ha SID 862377326

CS 111 ASSIGNMENT 3

due February 5, 2023

Problem 1:
a) Consider the following linear homogeneous recurrence relation: $R_n = 4R_{n-1} - 3R_{n-2}$. It is known that: $R_0 = 1$, $R_2 = 5$. Find R_3.

b) Determine the general solution of the recurrence equation if its characteristic equation has the following roots: 1, -2, -2, 2, 7, 7.

c) Determine the general solution of the recurrence equation $A_n = 256A_{n-4}$.

d) Find the general form of the particular solution of the recurrence $B_n = 3B_{n-2} - 2B_{n-3} + 2$.

Solution 1:
a) This linear recurrence has a characteristic equation of $x^2 - 4x + 3 = 0$. This can be factored into $(x-3)(x-1) = 0 \implies x = 1, 3$. From here, we can write the general solution:
$R_n = \alpha_1(1)^n + \alpha_2(3)^n = \alpha_1 + \alpha_2(3)^n$. We can now plug in R_0 and R_2 to solve for α.
$R_0 = 1 = \alpha_1 + \alpha_2$.
$R_2 = 5 = \alpha_1 + \alpha_2(3)^2$.
Solving this system of linear equations, we get $\alpha_{1,2} = \frac{1}{2}$. This means that the closed form for the recurrence is $R_n = \frac{1}{2}(3)^n + \frac{1}{2}$. We can plug in 3 and get $R_3 = \frac{1}{2}(3)^3 + \frac{1}{2} = 14$.

Problem 2: PROBLEM 2 GOES HERE

Solution 2: SOLUTION 2 GOES HERE

Problem 3: PROBLEM 3 GOES HERE

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