

Assignment 5

CS 310: Discrete Computational Structures
University of Regina
Department of Computer Science
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1. (35 points) Solve these recurrence relations together with the initial conditions given.
 - (a) $a_n = a_{n-1} + 6a_{n-2}$ for $n \geq 2$, $a_0 = 3$, $a_1 = 6$
 - (b) $a_n = 7a_{n-1} - 10a_{n-2}$ for $n \geq 2$, $a_0 = 2$, $a_1 = 1$
 - (c) $a_n = 6a_{n-1} - 8a_{n-2}$ for $n \geq 2$, $a_0 = 4$, $a_1 = 10$
 - (d) $a_n = 2a_{n-1} - a_{n-2}$ for $n \geq 2$, $a_0 = 4$, $a_1 = 1$
 - (e) $a_n = a_{n-2}$ for $n \geq 2$, $a_0 = 5$, $a_1 = -1$
 - (f) $a_n = -6a_{n-1} - 9a_{n-2}$ for $n \geq 2$, $a_0 = 3$, $a_1 = -3$
 - (g) $a_{n+2} = -4a_{n+1} + 5a_n$ for $n \geq 0$, $a_0 = 2$, $a_1 = 8$
2. (7 points) Find the solution to $a_n = 2a_{n-1} + a_{n-2} - 2a_{n-3}$ for $n = 3, 4, 5, \dots$, with $a_0 = 3$, $a_1 = 6$ and $a_2 = 0$.
3. (16 points) Determine whether the relation R on the set of all people is reflexive, symmetric, antisymmetric, and/or transitive, where $(a, b) \in R$ if and only if
 - (a) a is taller than b .
 - (b) a and b were born on the same day.
 - (c) a has the same first name as b .
 - (d) a and b have a common grandparent.
4. (32 points) Determine whether the relation R on the set of all real numbers is reflexive, symmetric, antisymmetric, and/or transitive, where $(x, y) \in R$ if and only if
 - (a) $x + y = 0$.

- (b) $x = \pm y$.
- (c) $x - y$ is a rational number.
- (d) $x = 2y$.
- (e) $xy \geq 0$.
- (f) $xy = 0$.
- (g) $x = 1$.
- (h) $x = 1$ or $y = 1$.

5. (10 points) Which of these relations on the set of all people are equivalence relations? Determine the properties of an equivalence relation that the others lack.

- (a) $\{(a, b) \mid a \text{ and } b \text{ are the same age}\}$
- (b) $\{(a, b) \mid a \text{ and } b \text{ have the same parents}\}$
- (c) $\{(a, b) \mid a \text{ and } b \text{ share a common parent}\}$
- (d) $\{(a, b) \mid a \text{ and } b \text{ have met}\}$
- (e) $\{(a, b) \mid a \text{ and } b \text{ speak a common language}\}$