8.2 Solving Linear Recurrence Relations

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

a \[ a_n = 3a_{n-1} + 4a_{n-2} + 5a_{n-3} \]
b \[ a_n = 2na_{n-1} + a_{n-2} \]
c \[ a_n = a_{n-1} + a_{n-4} \]
d \[ a_n = a_{n-1} + 2 \]
e \[ a_n = a_{n-1}^2 + a_{n-2} \]
f \[ a_n = a_{n-2} \]
g \[ a_n = a_{n-1} + n \]

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Solve these recurrence relations together with the initial conditions given.

a \[ a_n = 2a_{n-1} \text{ for } n \geq 1, a_0 = 3 \]
b \[ a_n = a_{n-1} \text{ for } n \geq 1, a_0 = 2 \]
c \[ a_n = 5a_{n-1} - 6a_{n-2} \text{ for } n \geq 2, a_0 = 1, a_1 = 0 \]
d \[ a_n = 4a_{n-1} - 4a_{n-2} \text{ for } n \geq 2, a_0 = 6, a_1 = 8 \]
e \[ a_n = -4a_{n-1} - 4a_{n-2} \text{ for } n \geq 2, a_0 = 0, a_1 = 1 \]
f \[ a_n = 4a_{n-2} \text{ for } n \geq 2, a_0 = 0, a_1 = 4 \]

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Find the solution to \[ a_n = 7a_{n-2} + 6a_{n-3} \text{ with } a_0 = 9, a_1 = 10, a_2 = 32. \]

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What is the general form of the solutions of a linear homogeneous recurrence relation if its characteristic equation has roots 1, 1, 1, -2, -2, -2, 3, 3, -4?
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What is the general form of the particular solution guaranteed to exist by Theorem 6 of the linear nonhomogeneous recurrence relation $a_n = 8a_{n-2} - 16a_{n-4} + F(n)$ if

a. $F(n) = n^3$?

b. $F(n) = (-2)^n$?

c. $F(n) = n2^n$?

d. $F(n) = n^24^n$?

e. $F(n) = (n^2 - 2)(-2)^n$?

f. $F(n) = n^42^n$?

g. $F(n) = 2$?

8.2 pg. 525 # 29

a. Find all solutions of the recurrence relation $a_n = 2a_{n-1} + 3^n$.

b. Find the solution of the recurrence relation in part (a) with initial condition $a_1 = 5$.

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Find all solutions of the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + (n + 1)2^n$. 