8.2 Solving Linear Recurrence Relations

8.2 pg. 524 # 1

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 $a_n = a_{n-1} + n$

8.2 pg. 524 # 3

Solve these recurrence relations together with the initial conditions given.

a $a_n = 2a_{n-1}$ for $n \geq 1, a_0 = 3$

b $a_n = a_{n-1}$ for $n \geq 1, a_0 = 2$

c $a_n = 5a_{n-1} - 6a_{n-2}$ for $n \geq 2, a_0 = 1, a_1 = 0$

d $a_n = 4a_{n-1} - 4a_{n-2}$ for $n \geq 2, a_0 = 6, a_1 = 8$

e $a_n = -4a_{n-1} - 4a_{n-2}$ for $n \geq 2, a_0 = 0, a_1 = 1$

f $a_n = 4a_{n-2}$ for $n \geq 2, a_0 = 0, a_1 = 4$

8.2 pg. 525 # 13

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

8.2 pg. 525 # 21

What is the general form of the solutions of a linear homogeneous recurrence relation if its characteristic equation has roots 1, 1, 1, 1, -2, -2, -2, 3, 3, -4?

8.2 pg. 525 # 27

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 $F(n) = n^2 4^n$?

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

f $F(n) = n^4 2^n$?

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 $a_1 = 5$.

8.2 pg. 525 # 33

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