California State University Sacramento - Math 101

Homework Assignment 11

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Exercise 6

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Solve

$$a_n = 3a_{n-1} - 2a_{n-2},$$

given that $a_0 = 2$ and $a_1 = 3$.

2. Solve

$$a_n - 6a_{n-1} + 9a_{n-2} = 0$$

given that $a_0 = 2$ and $a_1 = 3$.

3. Solve

$$a_n = \frac{1}{2}(a_{n-1} + a_{n-2}),$$

given that $a_0 = 0$ and $a_1 = 1$.

4. Solve

$$a_n - 4a_{n-1} + 4a_{n-2} = 0,$$

given that $a_0 = -\frac{1}{4}$ and $a_1 = 1$.

5. Solve

$$2a_n = a_{n-1} + 2a_{n-2} - a_{n-3},$$

SUBJECT: Homework Assignment 11 Matthew Mendoza

1. Solve

$$a_n = 3a_{n-1} - 2a_{n-2},$$

given that $a_0 = 2$ and $a_1 = 3$.

Recurrence relation written as $a_{n-3} + 2a_{n-2} = 0$

- · Charactistic equation: x2-3x+2=0
 - · Characteristic roots: a=1, a=2
- $a_n = A + B \cdot 2^n$; A + B = 2, A + 2B = 3
 - " We get A=B=1 by solving the system of A&B

$$S_{o}$$
, $a_{n} = 1 + 2^{n}$.

2. Solve

$$a_n - 6a_{n-1} + 9a_{n-2} = 0,$$

given that $a_0 = 2$ and $a_1 = 3$.

Recurrence relation written as $x^2-6x+9=0$

- · Characteristic roots: Q=3, multiplicity 2
- General solution: an=(A+Bn)·3n
 - $a_0=2$, $a_1=3 \Rightarrow A=2 \notin 3(A+B)=3$ - A=2, B=-1

$$S_{o_1}$$
 $C_{o_2} = (2-n)3^n$

3. Solve

$$a_n = \frac{1}{2}(a_{n-1} + a_{n-2}),$$

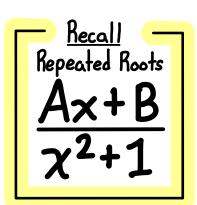
given that $a_0 = 0$ and $a_1 = 1$.

Recurrence relation written as $Q_0 = \frac{1}{2}Q_{0-1} - \frac{1}{2}Q_{0-2} = 0$

- · Characteristic equation: $\chi^2 \frac{1}{2}\chi \frac{1}{2} = 0$
- · Characteristic roots: Q1=1, Q2=-1/2
- General solution: On = A+B(-1)
 - ° a,=0, a,=1; A+B=0 \$ A-₹B=1 → A=3/3 \$ B=-3/3

So,
$$Q_n = \frac{3}{3}[1-(-\frac{1}{2})^n]$$

5. Solve



Recurrence relation of the form

Coan+C1an-1+...+Cran-r=0

4. Solve

$$a_n - 4a_{n-1} + 4a_{n-2} = 0,$$

given that $a_0 = -\frac{1}{4}$ and $a_1 = 1$.

Recurrence relation written as $x^2-4x+4=0$

- · Characteristic roots: a=2, multiplicity 2
- · General solution: On = (A+Bn)2n
 - ° Initial conditions: Qo = = = = = Q1 = 1 ⇒ A=- = 1/4 € 2(A+B)=1 ⇒ A=- = 1/4 €B=3/4

So,
$$a_n = (-\frac{1}{4} + \frac{3}{9})2^n = (3n-1)2^{n-2}$$

$$2a_n = a_{n-1} + 2a_{n-2} - a_{n-3},$$

$$2a_n = a_{n-1} + 2a_{n-2} - a_{n-3}$$

given that $a_0 = 0$, $a_1 = 1$ and $a_2 = 2$.

Recurrence relation written as: 2an-an-z-2an-z-an-z-0

- Charactistic equation: $2x^3 x^2 2x + 1 = 0$
- ° Characteristic roots: $Q_1=1$, $Q_2=-1$, and $Q_3=\frac{1}{2}$
- · an = A+B(-1)^++C(=)), a=0, a=1, and a=2
- $\Rightarrow A+B+C=0$, A-B+1/2C=1, and A+B+=C=2 $\Rightarrow A=5/2$, B=1/6, C=-8/3

So,
$$\alpha_n = \frac{5}{2} + \frac{1}{6}(-1)^n - \frac{8}{3}(\frac{1}{2})^n$$