

Tutorial 12 Week 13

1. (i) Show that $x_n = 6 \cdot 2^n - 4$ is a solution to the recurrence relation

$$x_n = 3x_{n-1} - 2x_{n-2}.$$

- (ii) Show that $x_n = (3^{n+1} - 1)/2$ is a solution to the recurrence relation

$$x_{n+1} - x_n = 3^{n+1}.$$

- (iii) Show that $x_n = n!$ is a solution to the recurrence relation

$$x_n - n(n-1)x_{n-2} = 0.$$

2. Solve the following recurrence relations:

(i) $x_n - 5x_{n-1} + 6x_{n-2} = 0$, $n \geq 2$, $x_0 = 3$, $x_1 = 7$

(ii) $x_n - 8x_{n-1} + 16x_{n-2} = 0$, $n \geq 2$, $x_0 = 3$, $x_1 = 20$.

3. Solve the following recurrence relations:

(i) $x_n = 10x_{n-1} - 25x_{n-2}$, for $n \geq 2$, where $x_0 = -1$ and $x_1 = 5$.

(ii) $x_{n+3} - 6x_{n+2} + 11x_{n+1} - 6x_n = 0$, for $n \geq 0$, where $x_0 = 1$, $x_1 = 0$ and $x_2 = -1$.

4. Solve the following recurrence relations:

(i) $x_n = 4x_{n-1} - 3x_{n-2}$, where $x_0 = 1$ and $x_1 = 2$.

(ii) $x_n = 3x_{n-1} - 3x_{n-2} + x_{n-3}$, where $x_0 = 0$, $x_1 = 1$ and $x_2 = 3$.

Problem Set 12

1. Solve the following recurrence relations:

(i) $x_n + 6x_{n-1} - 7x_{n-2} = 0$ for all $n \geq 2$, with $x_0 = 1$ and $x_1 = 2$.

(ii) $x_{n+3} - 4x_{n+2} + 5x_{n+1} - 2x_n = 0$ for all $n \geq 0$, with $x_0 = 4$, $x_1 = 7$ and $x_2 = 17$.

2. Solve the following recurrence relations:

(i) $x_{n+2} - 4x_{n+1} + 4x_n = 0$ for all $n \geq 0$, with $x_0 = 1$ and $x_1 = 4$.

(ii) $x_{n+2} + 2x_{n+1} - 3x_n = 0$ for all $n \geq 0$, with $x_0 = 1$ and $x_1 = -1$.

3. Solve the following recurrence relations:

(i) $x_n = -x_{n-1} + 6x_{n-2}$, where $x_0 = 7$ and $x_1 = 4$.

(ii) $x_n = 6x_{n-1} - 9x_{n-2}$, where $x_0 = -2$ and $x_1 = 6$.

4. Solve the following recurrence relations:

(i) $x_n = 5x_{n-1} - 6x_{n-2}$, where $x_0 = 1$ and $x_1 = 1$.

(ii) $x_n - 5x_{n-1} + 8x_{n-2} - 4x_{n-3} = 0$, where $x_0 = 0$, $x_1 = 2$ and $x_2 = 4$.