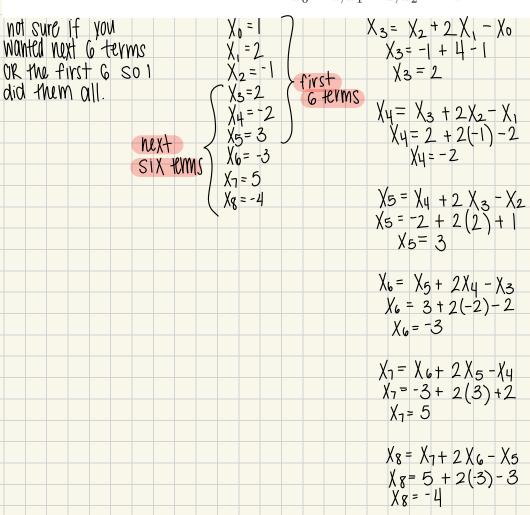
1. Compute the first six terms of the sequence satisfying the recurrence equation

$$x_n = x_{n-1} + 2x_{n-2} - x_{n-3}$$
 , $n \ge 3$

subject to the initial conditions

$$x_0 = 1, x_1 = 2, x_2 = -1$$



2. Solve explicitly the recurrence equation

$$x_n = 5x_{n-1} - 6x_{n-2}$$
 , $\xi = 2$

with initial conditions

$$x_0 = 0, x_1 = 1$$
.

$$Z^{2} = 5Z - G$$

$$Z^{2} - 5Z + (6 = 0)$$

$$(Z_{1} - 2)(Z_{2} - 3) = 0$$

$$Z_{1} = 2$$

$$Z_{2} = 3$$

$$X_{1} = C_{1}3^{n} + C_{2}2^{n}$$

$$X_{2} = 0 = C_{1} + C_{2}$$

$$X_{1} = | = 3C_{1} + 2C_{2}$$

$$X_{1} = | = 3C_{1} + 2C_{2}$$

$$X_{2} = -1$$

$$S01^{n} \cdot X_{1} = 3^{n} - 2^{n}$$

$$X_{2} = -1$$

3. (Corrected Sept. 6, 2025, thanks to Caroline Hill [who won a dollar].)

In a certain species of animals, only one-year-old, two-year-old are fertile.

The probabilities of a one-year-old, two-year-old, female to give birth to a new female are p_1 , p_2 , respectively.

Assuming that there were c_0 females born at n = 0, c_1 females born at n = 1 Set up a recurrence that will enable you to find the **expected** number of females born at time n.

In terms of c_0, c_1, p_1, p_2 , how many females were born at n = 4?

one-year olds at time
$$N = C_{N-1}$$

two-year olds at time $N = C_{N-2}$

$$C_{N} = P_{1} C_{N-1} + P_{2} C_{N-2}$$

$$Given C_{0}, C_{1} \rightarrow Find C_{3} and C_{4}$$

$$C_{3} = P_{1} C_{2} + P_{2} C_{1}$$

$$C_{4} = P_{1} C_{3} + P_{2} C_{2}$$

$$C_{4} = P_{1} C_{2} + P_{1} P_{2} C_{1} + P_{2} C_{2}$$

$$C_{4} = P_{1}^{2} C_{2} + P_{1} P_{2} C_{1} + P_{2} C_{2}$$

$$C_{4} = P_{2}^{2} C_{2} + (P_{1} C_{1} + C_{2}) P_{2}$$