

Evaluating Recursive Sequences

1. Find the first 4 terms of the sequence $a_n = a_{n-1} + 4$ where $a_1 = -1$.

$$\begin{array}{llll} a_2 = a_1 + 4 & a_3 = a_2 + 4 & a_4 = a_3 + 4 & -1, 3, 7, 11 \\ a_2 = -1 + 4 & a_3 = 3 + 4 & a_4 = 7 + 4 & \\ a_2 = 3 & a_3 = 7 & a_4 = 11 & \end{array}$$

2. Find the first 4 terms of the sequence $a_n = 4a_{n-1}$ where $a_1 = 12$.

$$\begin{array}{llll} a_2 = 4a_1 & a_3 = 4a_2 & a_4 = 4a_3 & 12, 48, 192, 768 \\ a_2 = 4(12) & a_3 = 4(48) & a_4 = 4(192) & \\ a_2 = 48 & a_3 = 192 & a_4 = 768 & \end{array}$$

3. Find the first four terms of the recursive sequence

$$\begin{array}{llll} a_1 = -3 & & & -3, 13, -35, 109 \\ a_n = 4 - 3a_{n-1} & & & \\ a_2 = 4 - 3a_1 & a_3 = 4 - 3a_2 & a_4 = 4 - 3a_3 & \\ a_2 = 4 - 3(-3) & a_3 = 4 - 3(13) & a_4 = 4 - 3(-35) & \\ a_2 = 13 & a_3 = -35 & a_4 = 109 & \end{array}$$

4. If $a_n = 3a_{n-1} - 4$ and $a_1 = 9$, find a_5

$$\begin{array}{llll} a_2 = 3a_1 - 4 & a_3 = 3a_2 - 4 & a_4 = 3a_3 - 4 & a_5 = 3a_4 - 4 \\ a_2 = 3(9) - 4 & a_3 = 3(23) - 4 & a_4 = 3(65) - 4 & a_5 = 3(191) - 4 \\ a_2 = 23 & a_3 = 65 & a_4 = 191 & a_5 = 569 \end{array}$$

5. Find the 8th term for the sequence where $a_n = 5a_{n-1} + 2n$ where $a_5 = 3$

$$\begin{array}{lll} a_6 = 5a_5 + 2(6) & a_7 = 5a_6 + 2(7) & a_8 = 5a_7 + 2(8) \\ a_6 = 5(3) + 12 & a_7 = 5(27) + 14 & a_8 = 5(149) + 16 \\ a_6 = 27 & a_7 = 149 & a_8 = 761 \end{array}$$

6. Find the first four terms of the recursive sequence defined below.

$$a_1 = -3$$

$$a_n = a_{(n-1)} - n$$

$$a_2 = a_1 - 2 \quad a_3 = a_2 - 3 \quad a_4 = a_3 - 4$$

$$a_2 = -3 - 2 \quad a_3 = -5 - 3 \quad a_4 = -8 - 4$$

$$a_2 = -5 \quad a_3 = -8 \quad a_4 = -12$$

$$-3, -5, -8, -12$$

7. A sequence is defined recursively by $f(1) = 16$ and $f(n) = f(n-1) + 2n$. Find $f(4)$.

- (1) 32 (2) 30 (3) 28 (4) 34

$$f(2) = f(1) + 2(2) \quad f(3) = f(2) + 2(3) \quad f(4) = f(3) + 2(4)$$

$$f(2) = 16 + 4 \quad f(3) = 20 + 6 \quad f(4) = 26 + 8$$

$$f(2) = 20 \quad f(3) = 26 \quad f(4) = 34$$

8. Find the third term in the recursive sequence $a_{k+1} = 2a_k - 1$, where $a_1 = 3$.

$$a_2 = 2a_1 - 1 \quad a_3 = 2a_2 - 1$$

$$a_2 = 2(3) - 1 \quad a_3 = 2(5) - 1$$

$$a_2 = 5 \quad a_3 = 9$$

2, +1

9. Which recursively defined function represents the sequence 3, 7, 15, 31, ...?

- 1) $f(1) = 3, f(n+1) = 2^{f(n)} + 3$
 2) $f(1) = 3, f(n+1) = 2^{f(n)} - 1$
~~3) $f(1) = 3, f(n+1) = 2f(n) + 1$~~
 4) $f(1) = 3, f(n+1) = 3f(n) - 2$

10. What is the fourth term of the sequence defined by $a_1 = 3xy^5$

$$a_n = \left(\frac{2x}{y}\right)a_{n-1}$$

- 1) $12x^3y^3$
 2) $24x^2y^4$
~~3) $24x^4y^2$~~
 4) $48x^5y$

$$a_2 = \left(\frac{2x}{y}\right)a_1$$

$$a_2 = \frac{2x}{y}(3xy^5)$$

$$a_2 = 6x^2y^4$$

$$a_3 = \left(\frac{2x}{y}\right)(a_2)$$

$$a_3 = \left(\frac{2x}{y}\right)(6x^2y^4)$$

$$a_3 = 12x^3y^3$$

$$a_4 = \left(\frac{2x}{y}\right)a_3$$

$$a_4 = \left(\frac{2x}{y}\right)(12x^3y^3)$$

$$a_4 = 24x^4y^2$$