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7.3 Recursive Formula

Explicit Formulas

Arithmetic $t_n = a + (n-1)d$

Geometric $t_n = ar^{n-1}$

For some sequences the general term can be expressed in a different way
→ each term depends on the previous term(s)

Consider 2, 12, 22, 32

Recursive Formula $\begin{cases} t_n = t_{n-1} + 10, & t_1 = 2 \end{cases}$

A recursive formula has 2 parts:

1) Beginning of the sequence
ex. $t_1 = -2$

2) Equation to determine the other terms.

If t_n depends on <u>one</u> previous term
t_1 must be given

If t_n depends on <u>two</u> previous terms
$t_1 + t_2$ must be given etc...

Ex. $t_n = 2(t_n - 1) + 7(t_n - 2)$

$t_1 = 1 \qquad t_2 = 2$

Ex. Write the first 5 terms

a) $t_n = t_{n-1} + 4 \qquad t_1 = -7$

$t_1 = -7 \quad t_2 = t_1 + 4 = -7 + 4 = -3 \quad t_3 = -3 + 4 = 1$

$t_4 = 1 + 4 = 5 \qquad t_5 = 9$

b) $t_n = t_{n-1} + t_{n-2} \qquad t_1 = 1 \; t_2 = 1 \; n > 2$

$t_1 = 1$
$t_2 = 1$
$t_3 = 2$

$t_4 = t_3 + t_2 = 3 \qquad t_5 = 5$

$\therefore 1, 1, 2, 3, 5, 8, 13, 21$

From a) determine the explicit formula

$a = -7 \quad d = 4$

$t_n = a + (n-1)d$
$= -7 + (n-1)(4)$
$= -7 + 4n - 4$
$= 4n - 11$