Unit 7: Discrete Functions
Arithmetic Sequences

Ex.1 Find the next 3 terms in each sequence:

(a) 3, 7, 11, 15, ... $19, 23, 27$

Δy +4 +4 +4   +4 +4 +4 $\longrightarrow$ slope = 4

n	t_n	Δt

t_1 t_2

(b) 9, 4, -1, -6, ... $-11, -16, -21$

-5 -5 -5 $\longrightarrow$ slope = -5

(c) 1, 1.25, 1.5, 1.75, ... $2, 2.25, 2.5$

$+0.25$ $+0.25$ $\longrightarrow$ slope = 0.25

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Ex.2 For the sequence 3, 9, 15, 21, ...

(a) find the 100th term. $+6$ $+6$ $+6$ $\longrightarrow$ slope = 6
(b) find a general expression for the nth term.

$t_1 = 3$
$t_2 = 9$ $\Big\} +6$
$\quad = 3 + 6$

$t_1 = 3$ $\Big\downarrow +6$
$t_2 = 9$ $\Big\downarrow +6$ $\Big\} + 2(6)$
$t_3 = 15$
$\quad = 3 + 2(6)$

$t_4 = 3 + 3(6)$
$t_5 = 3 + 4(6)$

$$\boxed{t_n = 3 + (n-1)(6)}$$

$t_{100} = 3 + (100 - 1)(6)$
$\quad = 3 + 99(6)$
$\quad = 597$

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An <u>arithmetic sequence</u> is a *linear function* where the difference between consecutive terms is a constant (called the <u>common difference</u>, *d*).
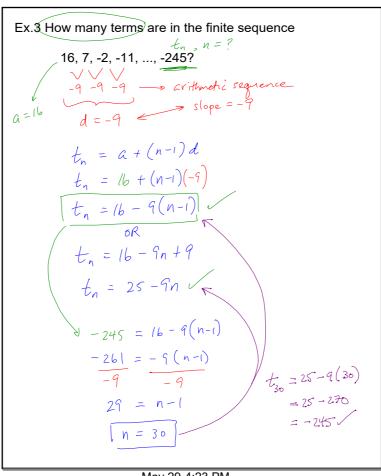
The first term, t_1, or $f(1)$, is a.

In general, the sequence is:
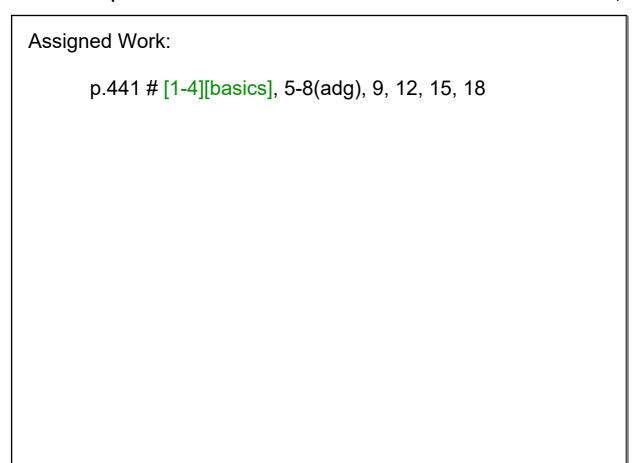
$$a,\ a + 1d,\ a + 2d,\ a + 3d,\ ...$$

$$t_1 \qquad t_2 \qquad t_3 \qquad t_4$$

The nth term is:

$$t_n = a + (n-1)d \qquad \text{or} \qquad f(n) = a + (n-1)d$$

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Ex.3 How many terms are in the finite sequence

16, 7, -2, -11, ..., -245?

$t_n,\ n = ?$

$a = 16$

$\vee \quad \vee \quad \vee$
$-9 \quad -9 \quad -9 \longrightarrow$ arithmetic sequence.

$d = -9 \longleftarrow$ slope $= -9$

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

$t_n = 16 + (n-1)(-9)$

$\boxed{t_n = 16 - 9(n-1)}$ ✓

OR

$t_n = 16 - 9n + 9$

$t_n = 25 - 9n$ ✓

$-245 = 16 - 9(n-1)$

$\dfrac{-261}{-9} = \dfrac{-9(n-1)}{-9}$

$29 = n - 1$

$\boxed{n = 30}$

$t_{30} = 25 - 9(30)$

$= 25 - 270$

$= -245$ ✓

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Assigned Work:

　　　p.441 # [1-4][basics], 5-8(adg), 9, 12, 15, 18

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