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Set up p. 38 for HW and p. 39 for notes

38

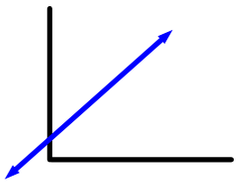
0.13 Recursive Sequences

39

linear function

$y = mx + b$

continuous



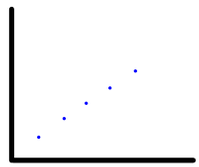
m = slope, rate of change, or common difference

b = starting amount, y-intercept or term 0

arithmetic sequence

$t(n) = mn + b$

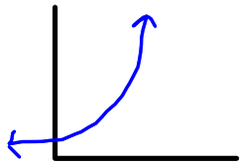
discrete



exponential function

$$y = a \cdot b^x$$

continuous



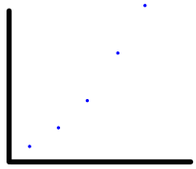
a = starting amount,
y-intercept or term 0

b = growth factor, multiplier,
or common ratio

geometric sequence

$$t(n) = a \cdot b^n$$

discrete



data table

term number → n | t(n) ← term in sequence

always start with 1 → **1**

values of the terms in the sequence (the numbers)

The domain is all integers ≥ 1

initial term or zeroth term or starting value

y-intercept

- defined as t(0)
- not listed as part of the sequence **but it is in the equation!**
- t(1) is the first term (or first number in the sequence)
- t(n) is the nth term

go to p. 39 in your NB

Review: The Language of Sequences

What does n stand for?

What does t(n) stand for?

What does t(n+1) stand for?

Examples

Consider the following sequences. Identify it as arithmetic or geometric. Make a table and write an equation to represent the sequence.

10, 13, 16, 19... pg 39

n	t(n)
1	10
2	13
3	16
4	19

cd = 3
constant difference
"cd"

$t(n) = 3n + 7$

$t(0) = 7$

30, 90, 270, 810...

n	t(n)
1	30
2	90
3	270
4	810

constant ratio
"cr"
cr = 3

$t(n) = 10 \cdot 3^n$

Think, Pair, Share

A-72. Look at the following sequence:

cd = 6 $t(n) = 6n - 14$

$t(10) = 6(10) - 14$

–8, –2, 4, 10, …

a. What are two ways that you could find the 10th term of the sequence? What is the 10th term?

60 - 14

$t(10) = 46$

b. If you have not done so already, write an equation that lets you find the value of any term $t(n)$. This kind of equation is called an **explicit equation**.

c. The next term after $t(n)$ is called $t(n+1)$. Write an equation to find $t(n+1)$ if you know what $t(n)$ is. An equation that depends on knowing other terms is called a **recursive equation**.

	explicit formula	recursive formula
arithmetic sequence	$t(n) = mn + b$	$t(n+1) = t(n) + m$ $t(0) = b$
geometric sequence	$t(n) = a \cdot b^n$	$t(n+1) = t(n) \cdot b$

HW - start it now!

Sequence	Type	Common difference or common ratio	Term 0	Explicit formula	Recursive formula
a. -4, -1, 2, 5, ...	arithmetic	$cd = 3$	-7	$t(n) = 3n - 7$	$t(n+1) = t(n) + 3$, $t(0) = -7$
b. 1.5, 3, 6, 12, ...	geometric	$cr = 2$	0.75	$t(n) = 0.75 \cdot 2^n$	$t(n+1) = t(n) \cdot 2$, $t(0) = 0.75$
d. 2, 3.5, 5, 6.5, ...	ari.	$cd = 1.5$	0.5	$t(n) = 1.5n + 0.5$	$t(n+1) = t(n) + 1.5$, $t(0) = 0.5$
f. 9, 7, 5, 3, ...	ari.	$cd = -2$	11		
g. 48, 24, 12, ...	geo.	$cr = \frac{1}{2}$	96		
h. 27, 9, 3, 1, ...	geo.	$cr = 1/3$	81		
j. 5/4, 5/2, 5, 10, ...	geo.	$cr = 2$	5/8		