

Notes: (Topic 2.2) Change in Linear and Exponential Functions

In the last section, we learned that arithmetic sequences behave like _____ functions and that geometric sequences behave like _____ functions.

We will look more closely at these connections today.

Arithmetic Sequences and Linear Functions	
Arithmetic Sequences	Linear Functions
$a_n = a_0 + dn$	$f(x) = b + mx$ Slope-Intercept Form
$a_n = a_k + d(n - k)$	$f(x) = y_i + m(x - x_i)$ Point-Slope Form

Geometric Sequences and Exponential Functions	
Geometric Sequences	Exponential Functions
$g_n = g_0 r^n$	$f(x) = ab^x$ or $f(x) = ar^x$
$g_n = g_k r^{(n-k)}$	$f(x) = y_i r^{(x-x_i)}$

It is important to recognize and understand the similarities and differences between **linear** and **exponential** functions.

Linear Functions vs. Exponential Functions	
Linear Functions	Exponential Functions
$f(x) = b + mx$	$f(x) = ab^x$
Over equal-length input-value intervals, the output values change at a constant rate .	Over equal-length input-value intervals, the output values change proportionately .
The change (m) in y is based on addition .	The change (b) in y is based on multiplication .
If you have two points , you can write the equation of a linear function, exponential function, arithmetic sequence, or a geometric sequence.	

Example 1: Selected values of several functions are given in the table below. For each table, determine if the function could be linear, exponential, or neither. Give a reason for your answer.

a)

x	$f(x)$
0	7
3	5
6	3
9	1
12	-1

b)

x	$g(x)$
1	0
2	1
3	4
4	9
5	16

c)

x	$h(x)$
0	1
2	2
4	4
6	8
8	16

d)

x	$k(x)$
5	80
10	40
15	20
20	10
25	5

Example 2: A wild rumor is spreading that Mr. Passwater won 3rd place in the World's Strongest Man Contest (Mr. Passwater ~~definitely~~ probably didn't start the rumor). The number of people that have heard the rumor can be modeled using a geometric sequence, where the 43 people had heard the rumor on day 3 and 140 people have heard the rumor on day 6. According to the model, how many people, to the nearest whole number, have heard the rumor by day 10?

Example 3: A large theater has rows of seats where the number of seats in each row can be modeled by an arithmetic sequence. If the fifth row has 31 seats and the eleventh row has 49 seats, determine how many seats there are in the twenty-fifth row.