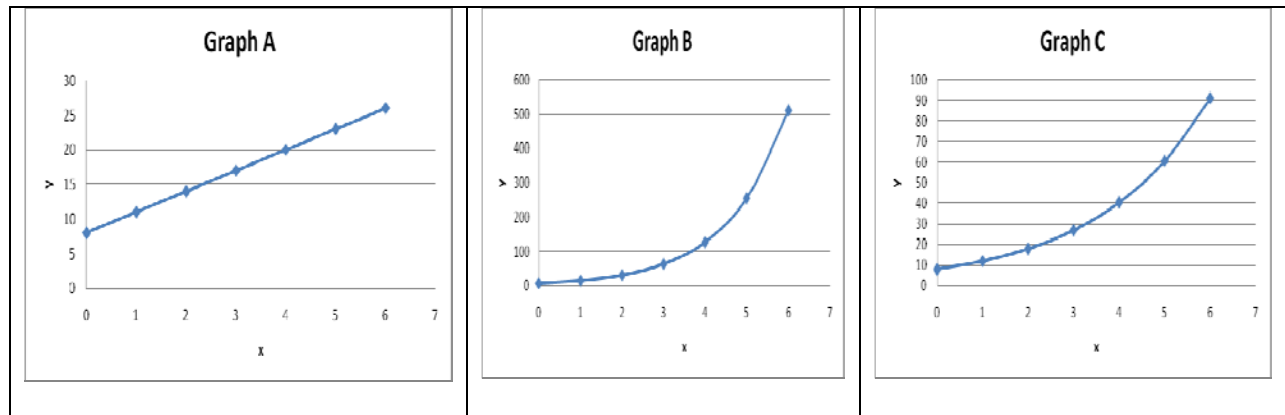


Day 6. Exponential Growth, Lesson 1.

Consider these three tables and their graphs. Notice the x values are going up one unit at a time. If the x values are always increasing by the same amount, then we can tell what type of growth we have by seeing whether we have a common difference or a common ratio (or possibly neither.)

Table A		Table B		Table C	
x	y	x	y	x	y
0	8	0	8	0	8
1	11	1	16	1	12
2	14	2	32	2	18
3	17	3	64	3	27
4	20	4	128	4	40.5
5	23	5	256	5	60.75
6	26	6	512	6	91.125



How is each graph growing? Linear or not linear?

A.

B.

C.

If the x values are always increasing by the same amount, then we can tell what type of growth we have by seeing whether we have a common difference or a common ratio (or possibly neither.)

That is, for these three sets, there is either a common difference or a common ratio. Which is it? And what is that common difference or common ratio?

Table A		Table B		Table C	
x	y	x	y	x	y
0	8	0	8	0	8
1	11	1	16	1	12
2	14	2	32	2	18
3	17	3	64	3	27
4	20	4	128	4	40.5
5	23	5	256	5	60.75
6	26	6	512	6	91.125

Common Diff: 3

Common Ratio: 2

Common Ratio: 1.5

When the x values go up by the same amount each time, and the y-values have a common difference, that means we have a linear relationship. **If the x-values go up by 1 each time, that common difference is called the slope.**

When the x-values go up the same amount each time, and the y-values have a common ratio, that means there is an exponential relationship. That **common ratio is called the growth factor.**

All three of these situations had the y-values increasing. But the y-values could be decreasing.

In a linear relationship, if the y-values are decreasing, that means the common difference is negative. Remember that a linear relationship that is decreasing has a negative slope.

In an exponential relationship, if the y-values are decreasing, that is called exponential decay. That happens when the common ratio is less than 1.

Footnote:

Here we have almost all the calculations for differences and ratios.

Table A		Diff	Ratio	Table B		Diff	Ratio	Table C		Diff	Ratio
x	y			x	y			x	y		
0	8			0	8			0	8		
1	11	11-8 =3	11/8= 1.375	1	16	16-8 =8	16/8=2	1	12	4	12/8 =1.5
2	14	14-11 =3	14/11 =1.27	2	32	32-16 =16	32/16=2	2	18	6	18/12 =1.5
3	17	17-14 =3	17/14 =1.21	3	64	32	64/32=2	3	27	9	27/18 =1.5
4	20	20-17 =3	20/17 =1.18	4	128	64	128/64 =2	4	40.5	13.5	40.5/27 =1.5
5	23	23-20 =3	23/20 =1.15	5	256	128	256/128 =2	5	60.75	20.25	60.75/ 40.5=1.5
6	26	26-23 =3	1.13	6	512	256	512/256 =2	6	91.13	30.38	1.5

Maricopa textbook: Exponential Growth. Lesson 1. Activity 1. Pages 214-215. Answers.

1.
 - a. Increasing about 25 for each step.
 - b. Decreasing by about 2400 for each step.
 - c. Increasing by larger and larger amounts.

2.
 - a. Average growth is about 25. The next value is about 675.
 - b. Average decline is about 2378. The next value is about 7826.
 - c. It is harder to describe this because the growth is increasing along the way. Maybe the next value would be about 650 more, for 3848.

Well, there are two ways we can think of alike and different.

 - a. and c. are increasing. b. is decreasing.
 - a. and b. are linear. c. is not linear.

3.
 - a. the graph shows increasing and linear.
 - b. the graph shows decreasing and linear.
 - c. the graph shows increasing and not linear.

4. There are two ways we can think of alike and different, as we discussed in number 2. The graphs show that.
 - a. a and c. have graphs that go up from left to right and b. has a graph that goes down from left to right. That agrees with what we said about a. and c. being increasing and b. being decreasing.
 - a. a and b. have steady growth (decline) all across, so they are linear, and c. has increasing growth, so the graph curves upward.

Day 6. **Homework on Exp. Growth. Lesson 1.** Due by Monday. Feb. 15.

Pages 217-221. 1, 3, 5, 7, 8, 9. (Notice how to find selected answers in the back of the book.)

Quiz: Due Monday, Feb. 15. **(Almost full credit for any reasonable attempt to work on these.)**

1. Page 217. Problem 2. For this graph, make a table of values (as well as you can estimate them) and find all the differences and ratios. Put them in a table like those in the handout. Then write a sentence to answer each of a and b. Those sentences will be similar to the sentences in problem 1 describing the growth. Notice that this data has fairly common differences and pretty common ratios, so it is possible to describe it in both ways.

2. Page 220. Problem 6. Fill in the table with all three columns and then try to answer the question.

3. Page 215. Activity 2. The final question is short. "At the time we notice that the pond is half-covered, how much time do we have left until it is fully covered?" Think about this question. There are several ways to investigate it. Some are shorter than others. Full credit will be given for any reasonable plan if you describe the plan and at least start to carry it out.