Opener for January 29, 2019

Given the following points: (1, 2) and (2, 6)

1. Make a table for the **ARITHMETIC** sequence for these points (add the next 2 terms).
   a. Write the recursive equation
   b. Write the explicit equation.
2. Make a table for the **GEOMETRIC** sequence for these points (add the next 2 terms)
   a. Write the recursive equation
   b. Write the explicit equation.
      i. Can you write two of them?

3. Sketch a graph of the two functions

Arithmetic

x	f(x)
1	2
2	6
3	10
4	14

Recursive:

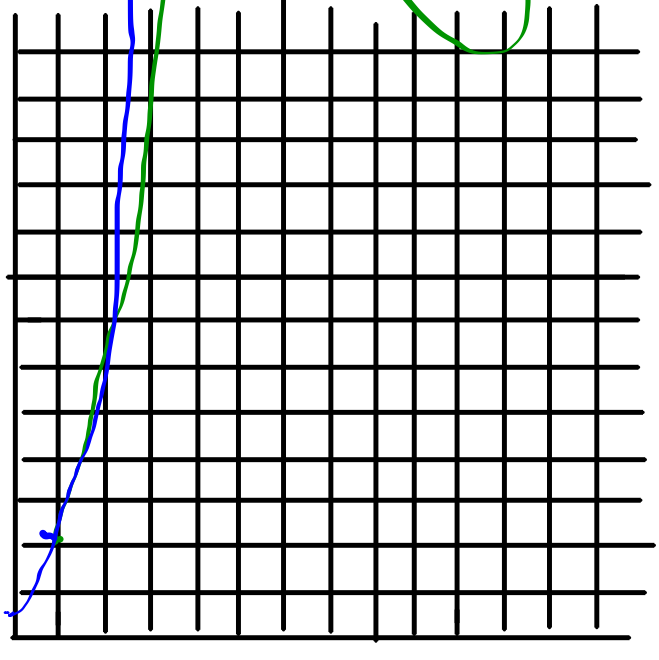
Explicit:

Geometric

x	f(x)
1	2
2	6
3	18
4	54

Recursive: $f(x) = f(x-1)(3)$

Explicit: $f(x) = 2 * 3^{x-1}$



Questions???

9.4H Linear OR Exponential

Name: _____ Per:_____

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Complete the following tables. Graph type: Linear, Exponential, Parabola or other

1.

x	$f(x)$
2	10
3	20
4	40
5	
10	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

2.

x	y
−2	23
−5	50
2	−13
4	−31

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

3.

x	$f(x)$
0	8
1	
2	200
3	1000
4	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

4.

x	$f(x)$
1	16
2	32
3	
4	
7	1024

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

5.

x	$f(x)$
1	32
2	
3	
4	256
5	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Exponential
d. $f(50)$ =_____

6.

x	$f(x)$
0	15,625
1	
2	
3	
5	5

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Exponential
d. $f(50)$ =_____

7.

x	$f(x)$
2	23
4	41
5	
10	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Linear
d. $f(50)$ =_____

8.

x	$f(x)$
2	500
3	
4	
5	62.5
10	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Exponential
d. $f(50)$ =_____

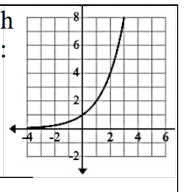
Answer the following based on the given information.

9. Each term is exactly – 8 times the previous term.
Graph type: _____
Explain:_____
_____
d or r_____

10. Each term is exactly $\frac{1}{3}$ of the previous term.
Graph type: _____
Explain:_____
_____
d or r_____

11. $f(x)=2x^2+6x+10$
Graph type: _____
Explain:_____
_____
d or r_____

12. Graph type:



d or r
_____

13. Fill in the table for both the Arithmetic and Geometric sequences

	1	2	3	4	5
Arithmetic	5				405
Geometric	5				405

14. **Write equations for each sequence in the table above.**

Arithmetic:

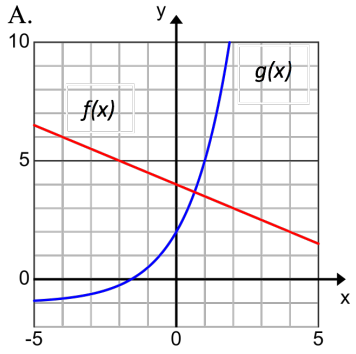
a. Recursive: _____
b. Slope-intercept: _____
c. Explicit: _____

Geometric:

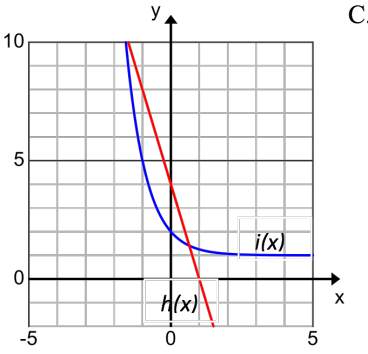
d. Recursive: _____
e. Explicit using $f(0)$: _____
f. Explicit using $f(1)$: _____

Using the graphs, answer the following questions.

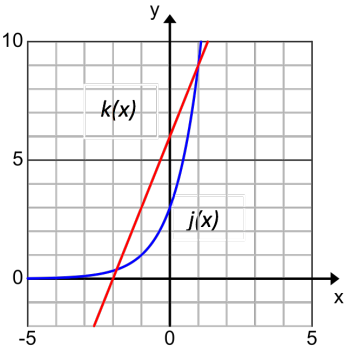
A.



B.



C.



15. In graph A,
    a. calculate the average rate of change for $\boldsymbol{g(x)}$ over the interval $[-5,\ 0]$._____
    b. calculate the average rate of change for $\boldsymbol{g(x)}$ over the interval $[\ 0, 1]$._____
    c. Using the average rate of change above, which function is changing faster over the interval $[0,1]$?_____

16. In graph B,
    a. calculate the average rate of change for $\boldsymbol{i(x)}$ over the interval $[-1,\ 0]$._____
    b. calculate the average rate of change for $\boldsymbol{i(x)}$ over the interval $[\ 0,\ 5]$._____
    c. Using the average rate of change above, which function is changing faster over the interval $[0,\ 5]$?_____

17. In graph C,
    a. calculate the average rate of change for $\boldsymbol{j(x)}$ over the interval $[-1,\ 0]$._____
    b. calculate the average rate of change for $\boldsymbol{j(x)}$ over the interval $[\ 0, 1]$._____
    c. Using the average rate of change above, which function is changing faster over the interval $[-1, 0]$?____

18. Ellie is planning to pay $4000 for a computer. She is trying to figure out which loan options is a better deal if she can make no payments on the computer for 5 years. She has two options:

Make a 4-column table for both options.

A. A simple interest loan where she pays the same 15% interest per year.

B. A compound interest loan where she pays 10% per year, but every year she has to pay interest on the total amount from the year before.

c. How much interest will Ellie pay for plan A on the 5th year? _____

d. How much interest will Ellie pay for plan B on the 5th year? _____

e. How much interest will Ellie pay in year 10 for plan A if she can't make payment until then? _____

f. How much interest will Ellie pay in year 10 for plan B if she can't make payment until then? _____

g. Which is the better deal? _____ Explain:

9.4H Linear OR Exponential Name: Key Per: /70

SHOW YOUR WORK AND WORK IN PENCIL

#1-8, 4 pts each

Complete the following tables. Graph type: Linear, Exponential, Parabola or other

1.

x	$f(x)$
2	10
3	20
4	40
5	
10	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

2.

x	y
−2	23
−5	50
2	−13
4	−31

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

3.

x	$f(x)$
0	8
1	
2	200
3	1000
4	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

4.

x	$f(x)$
1	16
2	32
3	
4	
7	1024

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: _____
d. $f(50)$ =_____

5.

x	$f(x)$
1	32
2	
3	
4	256
5	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Exponential
d. $f(50)$ =_____

6.

x	$f(x)$
0	15,625
1	
2	
3	
5	5

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Exponential
d. $f(50)$ =_____

7.

x	$f(x)$
2	23
4	41
5	
10	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Linear
d. $f(50)$ =_____

8.

x	$f(x)$
2	500
3	
4	
5	62.5
10	

a. Rec. f(x)=_____
b. Exp f(x)=_____
c. Graph type: Exponential
d. $f(50)$ =_____

3 3 3 2

Answer the following based on the given information.

9. Each term is exactly − 8 times the previous term.
Graph type: _____
Explain: _____
_____
d or r _____

10. Each term is exactly $\frac{1}{3}$ of the previous term.
Graph type: _____
Explain: _____
_____
d or r _____

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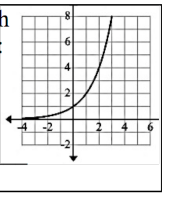
Explain: _____
_____
d or r _____

12. Graph type:
d or r _____



13. Fill in the table for both the Arithmetic and Geometric sequences

2

	1	2	3	4	5
Arithmetic	5				405
Geometric	5				405

14. **Write equations for each sequence in the table above.**

6

Arithmetic:

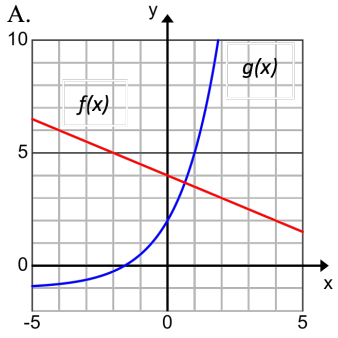
a. Recursive: _____
b. Slope-intercept: _____
c. Explicit: _____

Geometric:

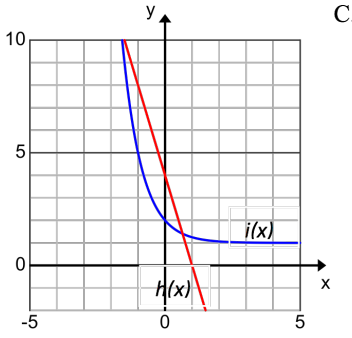
d. Recursive: _____
e. Explicit using $f(0)$: _____
f. Explicit using $f(1)$: _____

Using the graphs, answer the following questions.

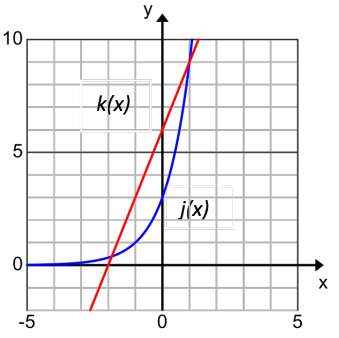
A.



B.



C.



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    b. calculate the average rate of change for $\boldsymbol{i(x)}$ over the interval $[\ 0,\ 5]$._____
    c. Using the average rate of change above, which function is changing faster over the interval $[0,\ 5]$?_____

17. In graph C,
    a. calculate the average rate of change for $\boldsymbol{j(x)}$ over the interval $[-1,\ 0]$._____
    b. calculate the average rate of change for $\boldsymbol{j(x)}$ over the interval $[\ 0, 1]$._____
    c. Using the average rate of change above, which function is changing faster over the interval $[-1, 0]$?____

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c. How much interest will Ellie pay for plan A on the 5th year? _____

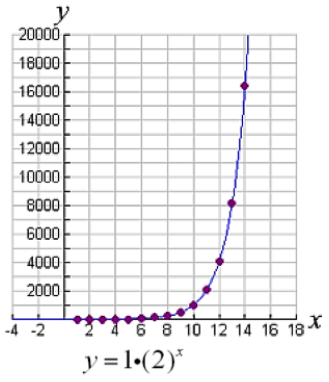
d. How much interest will Ellie pay for plan B on the 5th year? _____

e. How much interest will Ellie pay in year 10 for plan A if she can't make payment until then? _____

f. How much interest will Ellie pay in year 10 for plan B if she can't make payment until then? _____

g. Which is the better deal? _____ Explain:

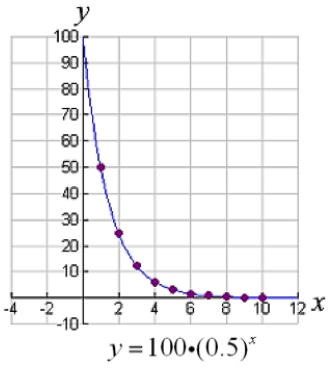
Growth & Decay



$y = 1 \cdot (2)^x$

Growth

r> 1



$y = 100 \cdot (0.5)^x$

Decay

0<r<1

Anything that grows or decays exponentially, grows or decays by a **fixed percent**.

For exponential growth, the rate of change increases with time --- it grows faster and faster.

For exponential decay, the rate of change decreases with time --- the decaying slows down.

Many real world situations can be modeled by exponential functions.

Examples of **exponential growth**:

*populations (rabbits, mice)

*bacteria and viruses (measles outbreak in Washington)

*credit payments (interest)

*investments increasing in value

Examples of **exponential decay**:

*radioactive substances

*investments losing value

*metabolism of some medicines

*value of objects (cars, phones)

Saratoga Springs had a population of about 35,000 in 2018. If the population is growing at a rate of 11% then how many people will live here in...

1 year? 38,850

5 years? 58,977

10 years? 99,379

50 years? 6,459,768

Write an equation for any year. $35000 \cdot 1.11^x$

How would the equation change if the population was decreasing instead of increasing?

Write a new equation.

$35{,}000 \cdot .89^{x}$

For exponential growth, we use the formula

$$f(t) = f(0)(1+r)^t$$

where $f(t)$ is the final amount, $f(0)$ is the initial amount, r is the percent of change written as a decimal, and t is the number of time intervals (years, days, months, etc).

For exponential decay, we use the formula

$$f(t) = a\,(1- r)^t$$

where $f(t)$ is final amount, a is initial amount, r is the percent of change expresses as a decimal, and t is the number of time intervals.

If the common ratio is greater than 1, **(r>1)**

$f(x) = f(0)r^x$ has a graph that goes up to the right and is increasing or **growing**.

If $0 < r < 1$, $f(x) = f(0)r^x$ has a graph that goes down to the right and is decreasing or **decaying**.

Growth & Decay