Review for Quiz Corrections

Day 2: Transformations of Functions **Name:** ______________________

Practice Assignment

For the following functions, name all the transformations and then give the y-intercept, asymptote, and whether it is growth or decay: a, h, k

Function	Transformations (a-value)	Y-intercept (k-value)	Asymptote (b-value)	Growth/Decay
a. $y = 3(2)^x$	Vertical stretch by 3	$3(2)^0 = 3(1) = 3$ (0, 3)	$Y = 0$	Growth b: $2 > 1$
b. $y = 5\left(\frac{1}{4}\right)^x - 4$	Vertical stretch by 5 down by 4	$5(1/4)^0 - 4$ $5(1) - 4 = 1$ (0, 1)	$y = -4$	Decay
c. $y = \frac{1}{2}(2)^x - 6$				

Function	Transformations	Y-intercept	Asymptote	Growth/Decay
d. $y=-7\left(\frac{1}{3}\right)^x+2$	reflect over x-axis; vertical stretch by 7; up by 2	$-7(1/3)^0+2$ $-7(1)+2$ $=-5$ $(0,-5)$	$y=2$	Decay
e. $y=2\left(\frac{1}{4}\right)^x$				
f. $y=\frac{1}{4}\left(\frac{3}{2}\right)^x+1$				
g. $y=-3(5)^x+4$				

Function	Transformations	Y-intercept	Asymptote	Growth/Decay
h. $y = 4(2)^{x+3} - 6$	Vertical stretch by 4; left by 3; down by 6	$4(2)^{0+3} - 6$ $4(8) - 6 = 26$ $(0, 26)$	$y = -6$	Growth
i. $y = 3\left(\frac{1}{2}\right)^{x-1} + 1$	Stretch by 3 Right by 1 up by 1	$3\left(\frac{1}{2}\right)^{0-1} + 1$ $3(2) + 1 = 7$ $(0, 7)$	$y = 1$	Decay

1. Create an equation to represent each table or graph.

x	−3	−2	−1	0	1	2	3
y	4	8	16	32	64	128	256

$y = a \cdot b^x$

$32 = a \cdot b^0$

$32 = a(1)$

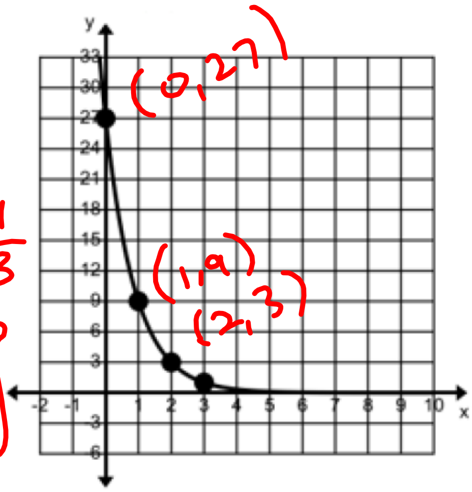
$\boxed{a = 32}$

$64 = 32(b)^1$

$\frac{64}{32} = \frac{32b}{32}$

$\boxed{b = 2}$

$\boxed{y = 32(2)^x}$

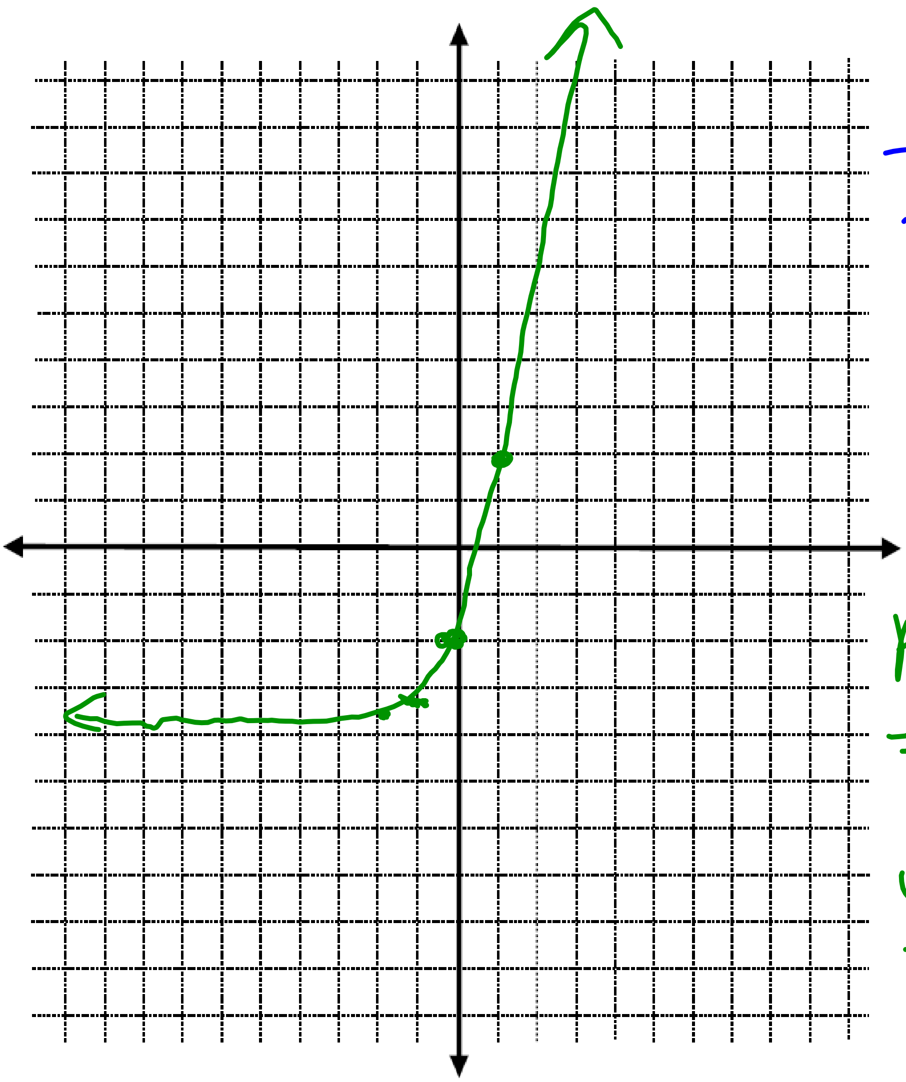


$a = 27$

$b = \frac{9}{27} = \frac{1}{3}$

$\boxed{y = 27(1/3)^x}$

2. Graph the following function: $y = 2 \cdot 3^x - 4$



X	Y
-2	$-34/9 = -3.8$
-1	$-10/3 = -3.3$
0	-2
1	2
2	14

Asymptote $= y = -4$

y-int $=$ $(0, -2)$

3. Determine if the following ordered pairs is linear, quadratic, or exponential and explain why.

$\{(-2, \underline{2}), (-1, \underline{4}), (0, \underline{6}), (1, \underline{8}), (2, \underline{10})\}$

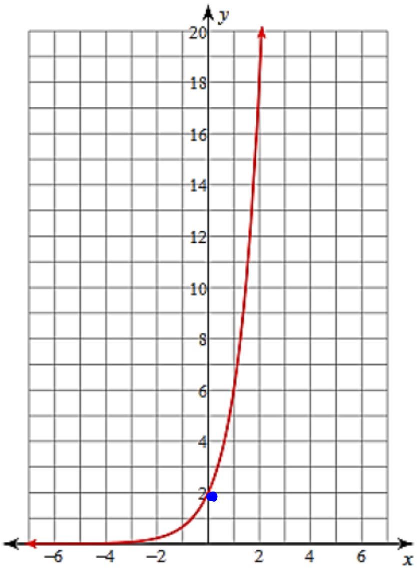
Common difference of 2

Therefore it is a Linear Function.

$\{(-2, \underline{8}), (-1, \underline{4}), (0, \underline{2}), (1, \underline{1}), (2, \underline{0.5})\}$

$\frac{2^{nd}\ \#}{1^{st}\ \#} = \frac{4}{8} = \frac{1}{2}$ or 0.5

It ha a common ratio of 1/2. So it is an exponential function.



Domain: $\mathbb{R}$

Range: $y>0$ or $(0,\infty)$

X-intercept: none

y-intercept: $(0,2)$

Interval of Increase: $(-\infty,\infty)$

Interval of Decrease: none

Maximum(s): none

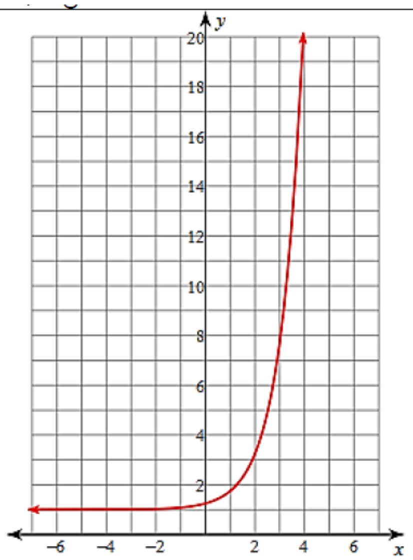
Minimum(s): $y=0$

Asymptote: $y=0$

End Behavior:
as $x \to -\infty$, $f(x) \to$ 0
as $x \to \infty$, $f(x) \to$ ∞

Positive: $\mathbb{R}$

Negative: none



Domain: $\mathbb{R}$

Range: $y > 1$ or $(1, \infty)$

X-intercept: none

y-intercept: (0, 1.3)

Interval of Increase: $(-\infty, \infty)$

Interval of Decrease: none

Maximum(s): none

Minimum(s): $y = 1$

Asymptote: $y = 1$

End Behavior:

as $x \to -\infty$, $f(x) \to$ 1

as $x \to \infty$, $f(x) \to$ ∞

Positive: $\mathbb{R}$

Negative: none

Unit 4 Quiz Corrections 3/27/18

1. On a separate sheet of paper, write the questions you got wrong on the quiz and answer the questions for credit recovery.
2. You have 15 minutes to do this!!!

Learning Objectives 3/27/18

I can write explicit and recursive formulas for geometric sequences.

Opening:

- What is a sequence
- Sequences can be finite or infinite.
- Can you give me examples of sequences?

Pages 25 - 30

Day 7 – Geometric Sequences

For the following patterns, find the next two numbers. Then describe the rule you are apply each time.

	Rule	Constant Ratio
a. 5, 25, 125, 625, 3125, 15625, ...	multiply by 5	5
b. 192, 96, 48, 24, 12, 6, ...	dividing by 2	0.5
c. 81, 27, 9, 3, 1, 1/3, ...	dividing by 3	1/3 or 0.3
d. 2, 8, 32, 128, 512, 2048, ...	multiply by 4	4

What did you notice about all of your patterns? They are increasing or decreasing by multiplying or dividing by a common ratio

Sequences

A **sequence** is a pattern involving an ordered arrangement of numbers, geometric figures, letters, or other objects. A sequence, in which you get the next consecutive term by multiplying or dividing a constant is called a **geometric sequence**. In other words, we just multiply or divide the same value over and over…infinitely. The constant value is called the **constant ratio,** or common ratio.

What you may not realize is when it comes to geometric sequences is that they are considered exponential functions. The position of each term is called the **term number** or **term position.** We can think of the term number or position as the input (domain) and the actual term in the sequence as the output (range). Instead of using x for the input, we are going to use n and instead of using y for the output, we are going to use a_n.

Term Number (n)	1	2	3	4	5
Term (a_n)	1	6	36	216	1296

Two ways to define sequences:

1. Closed/Explicit:

- Can directly find nth term
- NOT required to list 1st term
- Uses formula $a_n = a_1(r)^{n-1}$

for geometric sequences

2. Recursive:

- Relates each term in the sequence to a previous term
- Must ALWAYS state 1st term
- Requires formula that relates the nth term to the $(n-1)^{th}$ term

Explicit Formula for Geometric Sequences

Constant Ratio

Explicit Formula: $$a_n = a_1 \cdot r^{n-1}$$

nth Term

1st Term

Why We Have a Formula for Sequences

Take a look at the following pattern: **2, 4, 8, 16, ...** 32, 64, 128

What is the 3rd term? 8 What is the 5th term? 32 What is the 7th term? 128

What is the pattern? Multiply by 2 What is the 1st term? 2

What is the 54th term? ________ (You don't want to multiply ____ over and over 54 times?!?!?!?)

This is why the **Explicit Formula** was created – as long as you know your constant ratio and 1st term, you can create a rule to describe any geometric sequence and use it to find any term you want.

Creating an Explicit Rule	
1. Write down the Explicit Formula. 2. Substitute the first term in for a_1 and constant ratio in for r. 3. To find an nth term, substitute the term number you are wishing to find into n.	

Write an Explicit Rule for the following sequences:

a. 3, 6, 12 ,...

$r = \frac{6}{3} = 2$

$a_1 =$ 3

$r =$ 2

Rule: $a_n = 3(2)^{n-1}$

b. 400, 200, 100, ...

$a_1 =$ 400

$r = \frac{200}{400} = 0.5$

Rule: $a_n = 400(0.5)^{n-1}$

c. 40, 10, $\frac{5}{2}$,...

$a_1 =$ 40

$r = \frac{10}{40} = 1/4$ or 0.25

Rule: $a_n = 40(0.25)^{n-1}$

d. -1, 3, -9, ...

$a_1 =$ -1

$r =$ -3

Rule: $a_n = -1(-3)^{n-1}$

e. 128, 32, 8, ...

$a_1 =$ 128

$r = \frac{32}{128} = 1/4$

Rule: $a_n = 128(1/4)^{n-1}$

f. -2, -12, -72

$a_1 =$ -2

$r =$ 6

Rule: $a_n = -2(6)^{n-1}$

$a_{10} = -2(6)^9 = -20155392$

Examples - Finding the Nth Term

Finding the Nth Term

To find the nth term, particularly when the nth term is quite large, you want to create an Explicit Rule first and then substitute that term number into the rule for n.

For the given sequences, create an explicit rule and then use the rule to find the following terms:

a. 1.5, 4.5, 13.5, ... a_7

$a_1 = 1.5$

$r = \frac{4.5}{1.5} = 3$

$a_n = 1.5(3)^{n-1}$

$a_7 = 1.5(3)^6$

$a_7 = 1093.50$

b. 162, 108, 72, 48, ... 8th term

$a_1 = 162$

$r = \frac{108}{162} = \frac{2}{3}$

$a_n = 162(2/3)^{n-1}$

$a_8 = 162(2/3)^7$

$\boxed{a_8 = 9.48}$