GENERAL MATHEMATICS 11

Name of Learner:_____ Grade Level: _____

Section:_____ Date: _____

Learning Activity Sheet
Intercepts, Zeroes and Asymptotes of Logarithmic Functions

Background Information for Learners

This activity sheet was designed to enrich the understanding of learners on the intercepts, zeroes and asymptotes of logarithmic functions. In addition, this would support learners to become independent problem solvers.

The graph of a logarithmic function has different features. These are intercepts, asymptotes and zeroes. The identification of these features can be done through construction of its table of values and sketching its graph. In addition, the properties of logarithmic functions should be taken into consideration.
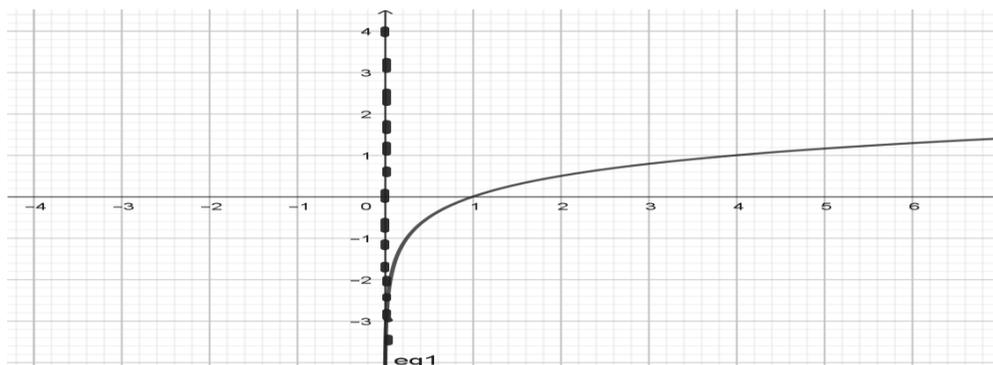

Properties of Logarithmic Functions
- ➢ It is a one-to-one function. It satisfies the horizontal line test
- ➢ The x-intercept is 1. There is no y-intercept
- ➢ The vertical asymptote is the line x=0. There is no horizontal asymptote.

Study the given example.

a. *Example 1*. Sketch the graph of $y = log_4 x$. Determine its intercepts, asymptotes and zeroes.

Solution:

x	1/16	1/4	1	4	16
y	-2	-1	0	1	2

x-intercept	y-intercept	vertical asymptote	Horizontal asymptote	zeroes
1	none	x=0	none	1

There are also guidelines for graphing transformations of logarithmic functions.

Graph of $f(x) = a \cdot log_b(x - c) + d$

➢ The value of b (either b >1 or 0 < b < 1) determines whether the graph is increasing or decreasing
➢ The value of a determines the stretch or shrinking of the graph. Further, if a is negative, there is a reflection of the graph about the x-axis
➢ Based on $y = a \cdot log_b x$, the vertical shifts is d units up (if d > 0) or d units down (if d < 0), and the horizontal shift is c units to the right (if c > 0) or c units to the left (if c < 0)

Consider the example below.

Example 2: Analyze the function, $g(x) = log_4(x - 3)$ using the transformations to describe how the graph is related to $f(x) = log_4 x$. Identify also the intercepts, asymptotes and zeroes.

Solution:
The graph of $g(x) = log_4(x - 3)$ is shifted 3 units to the right from the graph of $f(x) = log_4 x$
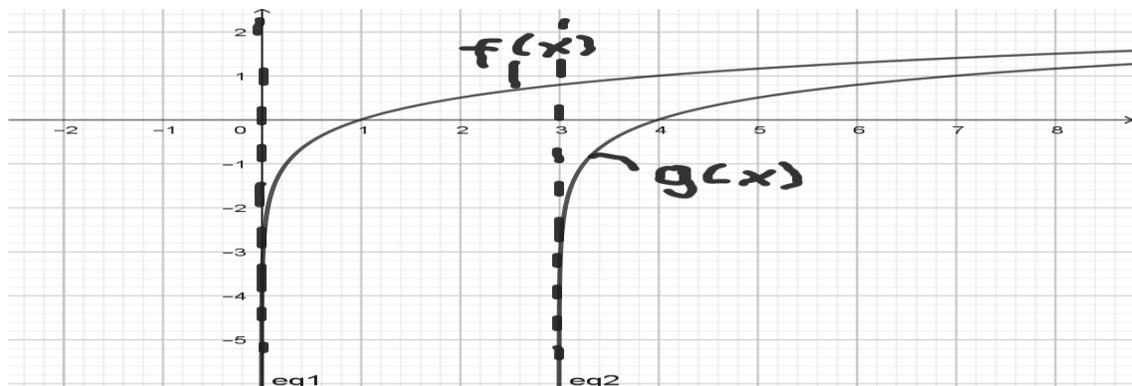
x-intercept	y-intercept	vertical asymptote	Horizontal asymptote	zeroes
4	none	x=3	none	4

Learning Competency: The learners determine the intercepts, zeroes and asymptotes of logarithmic functions **(M11GM-Ii-4)**
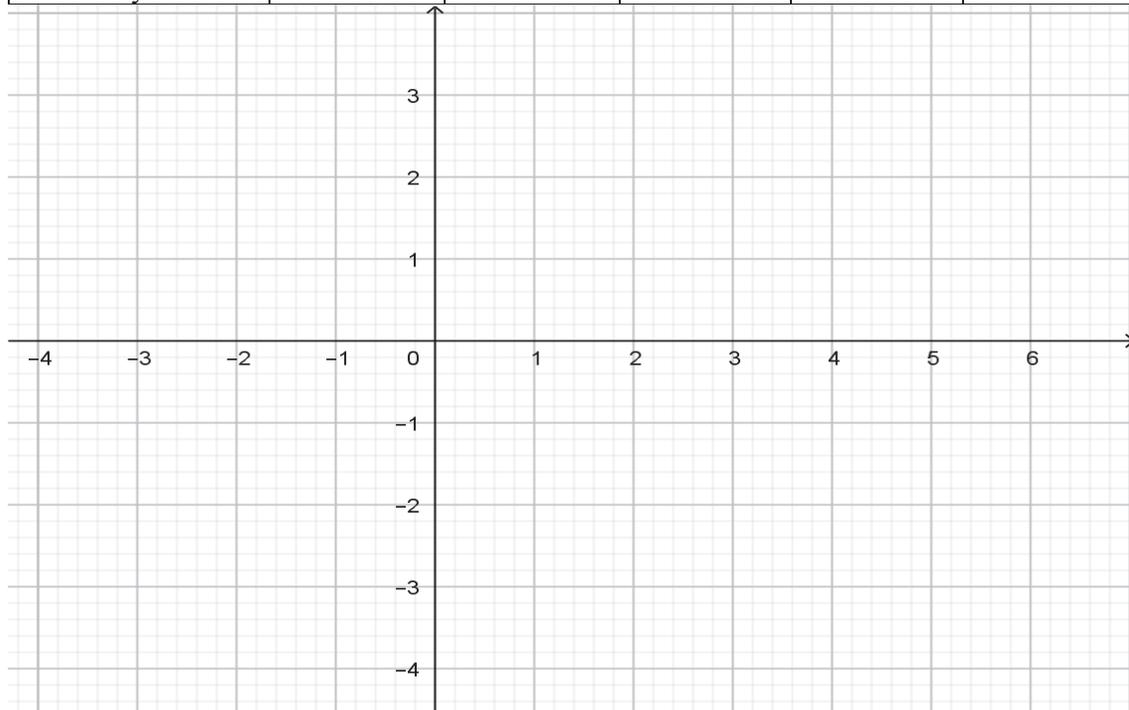
Activity 1- Observe and Learn

Directions: Complete and observe the table of values of the given exponential and logarithmic functions. Answer what is being asked.

$y=2^x$

X	-2	-1	0	1	2
Y					

$y=\log_2 x$

x	1/4	1/2	1	2	4
y					

20. What can you say about the given table of values?

21. Do you think the intercepts, zeroes and asymptotes of the given logarithmic function can be found in its table of values? How?

22. What are the intercepts, zeroes and asymptotes of the given logarithmic function?

23. Can you draw conclusions in determining the intercepts, zeroes and asymptotes of a logarithmic function based on the given? Cite at least one.

Activity 2- Graph to a Right Path

Directions: Sketch the graph of the following logarithmic functions. Determine their intercepts, zero/es and asymptotes.
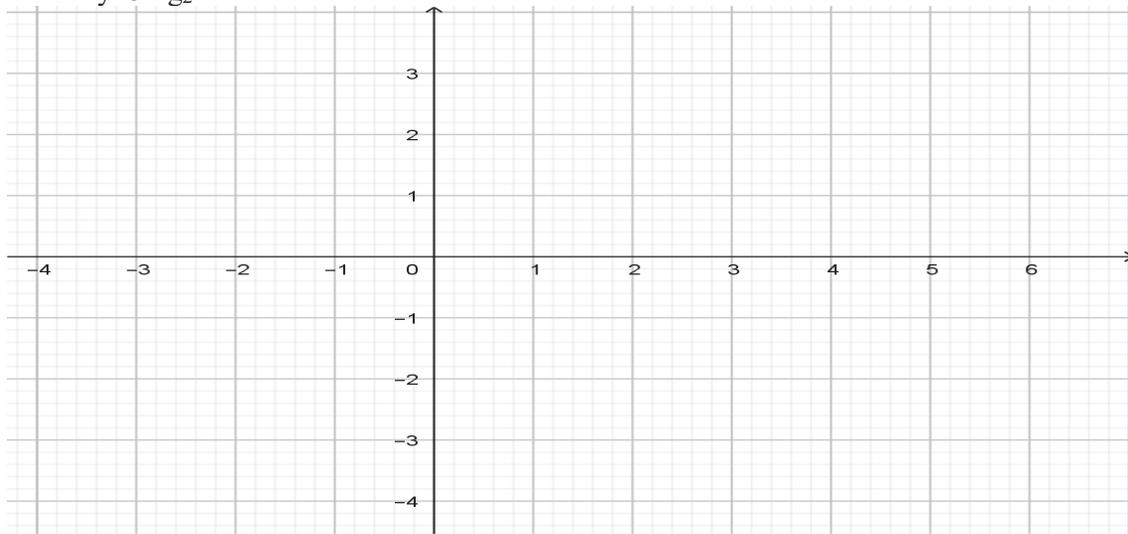
1. $f(x)= \log_3 x$
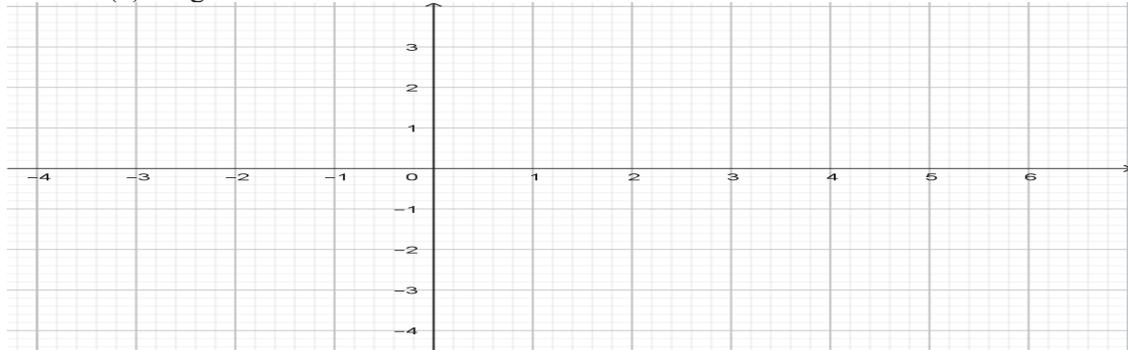
x-intercept/s:
y-intercept/s:
horizontal asymptote/s:
vertical asymptote/s:
zero/es:

2. $y=3\log_2 x$

x-intercept/s:
y-intercept/s:
horizontal asymptote/s:
vertical asymptote/s:
zero/es:

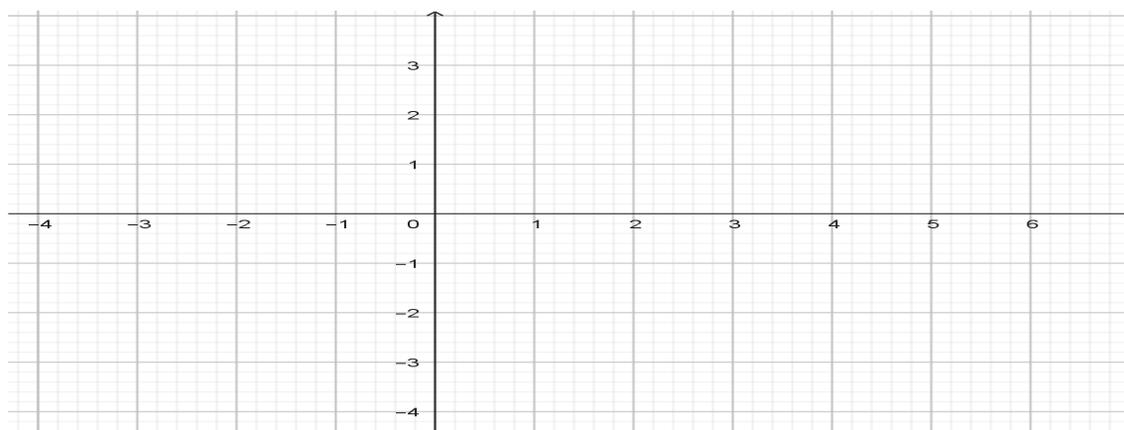## Activity 3- The Graphing Transformation
Directions: Sketch the graph of the following functions in one (1) cartesian plane. Analyze the graph of each function by observing the transformations to describe how the graph is related to $y = \log_2 x$. Identify the intercepts, asymptotes and zeroes of each function.

$f(x)= \log_2 x$
$g(x)= 3\log_2 x$
$h(x)=\log_2(x-1)$

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$j(x) = \log_2(x) + 4$

Observations:

Function	x-intercept/s	y-intercept/s	horizontal asymptote/s	vertical asymptote/s	Zero/es
$f(x) = \log_2 x$					
$g(x) = 3\log_2 x$					
$h(x) = \log_2(x-1)$					
$j(x) = \log_2(x) + 4$					

Rubrics for Scoring
Activity 1-Observe and Learn

	3 points	2 points	1 point	0 point
Understanding	Learner shows a thorough understanding on how to solve problems using logarithm	Learner shows a partial understanding on how to solve problems using logarithm	Learner shows a limited understanding on how to solve problems using logarithm	Learner shows no understanding on how to solve problems using logarithm
Entries in the table of values	Learner completed the table of values with correct entries	Learner completed the table of values but some entries were incorrect	Learner completed the table of values but many entries were incorrect	Learner failed to complete the table of values

Activity 2-Observe and Learn

	3 points	2 points	1 point	0 point
Amount of Work	Learner sketched both graphs accurately with proper label	Learner sketched both graphs accurately with no label	Learner sketched at least 1 graph	Learner failed to sketch any graph
Comprehension	Learner identified all the features of both logarithmic functions	Learner identified at least half of the features of both logarithmic functions	Learner identified at least half of the features of any of the given logarithmic functions	Learner failed to identify the features of the given logarithmic functions

Activity 3-The Graphing Transformation

	4 points	3 points	2 points	1 point	0 point
Amount of Work	Learner sketched all graphs accurately with proper label	Learner sketched 2-3 graphs accurately with proper label	Learner sketched 2-3 graphs accurately with no label	Learner sketched at least 1 graph	Learner failed to sketch any graph
Understanding	Learner identified all the features of all logarithmic functions	Learner identified all the features of at least half of the logarithmic functions	Learner identified at least half of the features of all logarithmic functions	Learner identified at least half of the features of at least half of the logarithmic functions	Learner failed to identify the features of the given logarithmic functions
Quantity of Observation	Learner listed all relevant observations	Learner listed 2 relevant observations	Learner listed 1 relevant observation	Learner listed irrelevant observations	Learner failed to list his/her observations

Reflection

Share your technique/s in doing the given task.

References

Sharon L. Senk et al. UCSMP Advanced Algebra. Second Edition.(2002). Pearson Education Inc

General Mathematics Learner's Material. First Edition 2016

Answer Key

Activity 1-Observe and Learn

$y=2^x$

x	-2	-1	0	1	2
y	1/4	1/2	1	2	4

$y=\log_2 x$

x	1/4	1/2	1	2	4
y	-2	-1	0	1	2

1. Exponential and logarithmic functions are inverses with each other
2. Yes because the table of values is a mechanism for sketching the graph of a function which in return the identification of its features
3. x-intercept: 1   horizontal asymptote: none   zero/es: 1
   y-intercept: none   vertical asymptote: x=0
4. A logarithmic function has no y-intercept and horizontal asymptote
   The x-intercept, vertical asymptote and zeroes are present in a logarithmic function
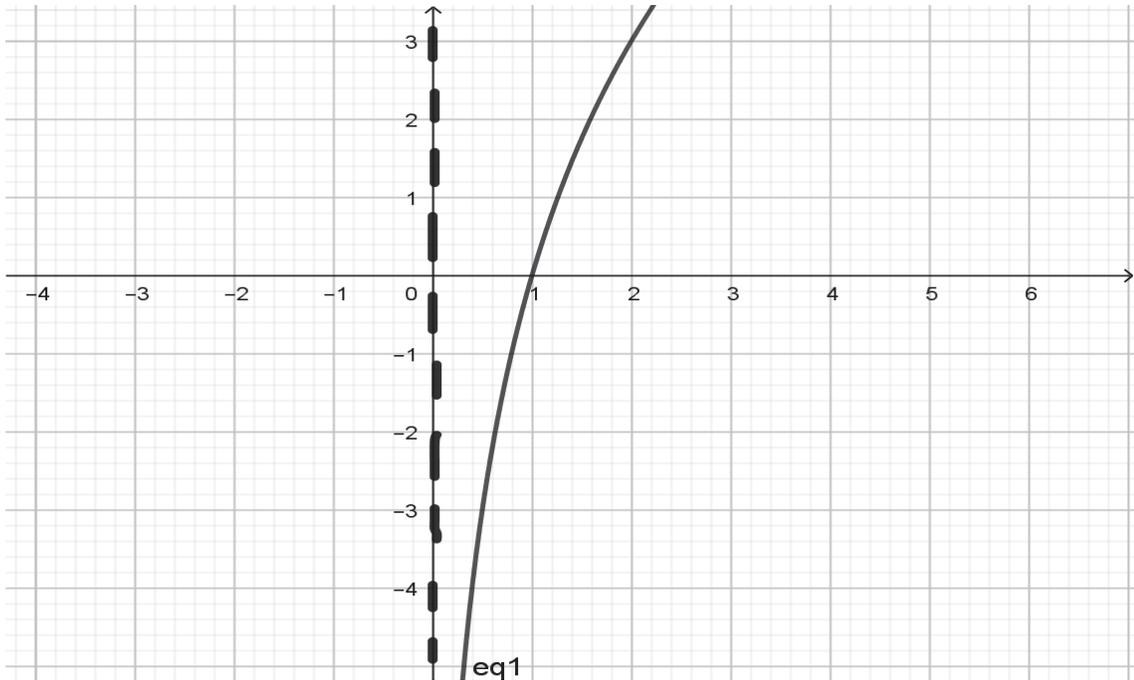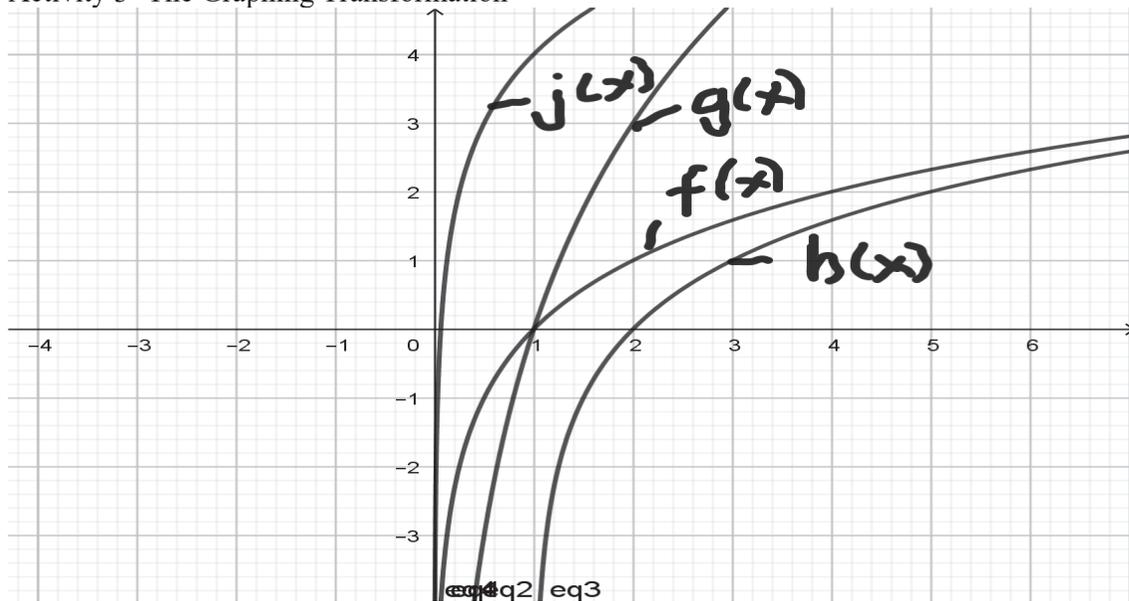
Activity 2-Observe and Learn
1.
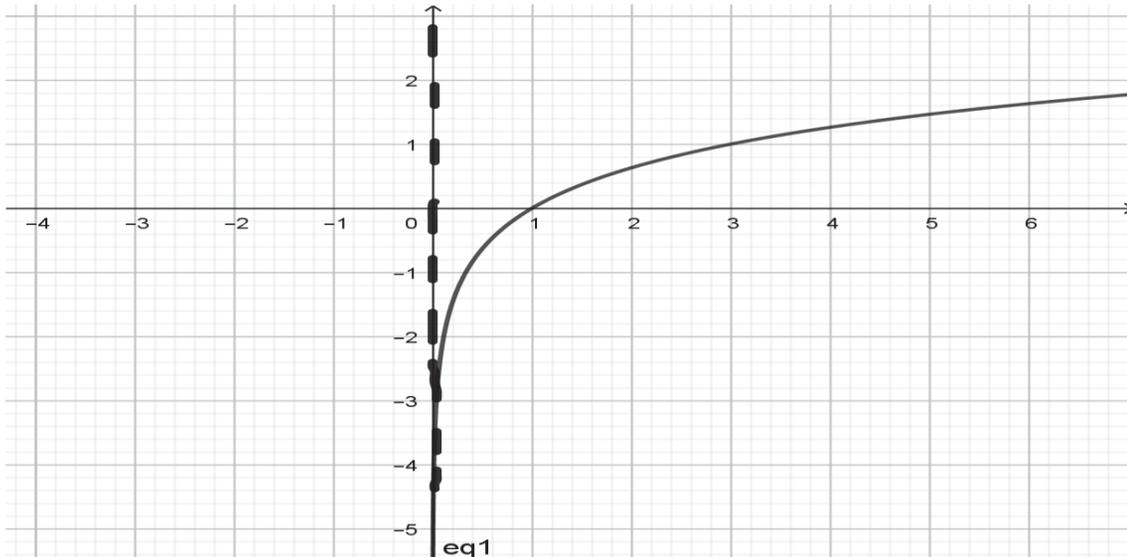
x-intercept/s: 1
y-intercept/s: none
horizontal asymptote/s: none
vertical asymptote/s: x=0
zero/es: 1

2.

eq1

x-intercept/s: 1
y-intercept/s: none
horizontal asymptote/s: none
vertical asymptote/s: x=0
zero/es: 1

Activity 3- The Graphing Transformation

j(x)   g(x)
        f(x)
          h(x)

eq4 eq2 eq3

Observations
- ➢ The graph of h(x) is the graph of f(x) shifted 1 unit to the right
- ➢ The graph of j(x) is a vertical shift of 4 units upward from the graph of f(x)

n	x-intercept/s	y-intercept/s	horizontal asymptote/s	vertical asymptote/s	zero/es
$f(x) = \log_2 x$	1	none	none	x=0	1
$g(x) = 3\log_2 x$	1	none	none	x=0	1
$h(x) = \log_2(x-1)$	2	none	none	x=1	2
$j(x) = \log_2(x) + 4$	1/16	none	none	x=0	1/16