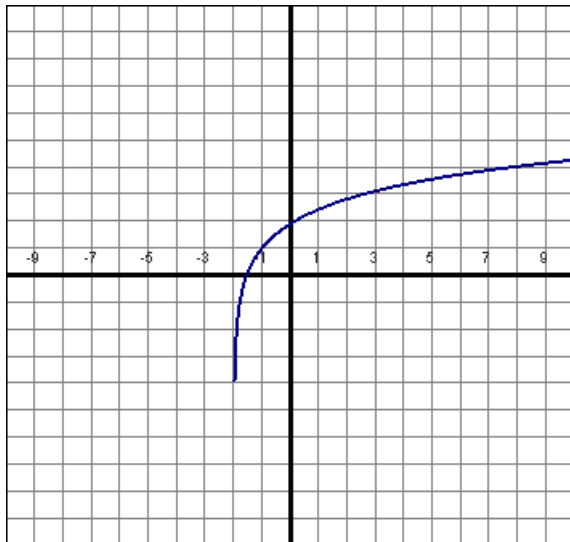


Unit 3: Exponential and Logarithmic Functions

Activity 3: Investigating Transformations and Sketching Graphs of Logarithmic Functions

Formative Assignment

1. Fill in the key features of the function $f(x)$ defined by the graph below:



Domain	<input type="text"/>
Range	<input type="text"/>
x-intercept	<input type="text"/>
y-intercept	<input type="text"/>
Intervals of Increase/Decrease	<input type="text"/>
Vertical/Horizontal Asymptote	<input type="text"/>
Equation of Asymptote	<input type="text"/>

2. Fill in the key features of $g(x)$ defined by the function $g(x) = \log[-3(x + 2)]$:

Domain	
Range	
x-intercept	
y-intercept	
Intervals of Increase/Decrease	
Vertical/Horizontal Asymptote	
Equation of Asymptote	

3. Describe the following transformations on $y = \log x$

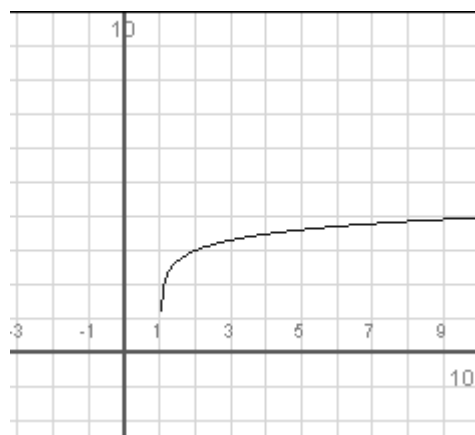
a) $y = 2\log[-2(x - 1)]$

b) $y = -3\log[(x + 4)] - 5$

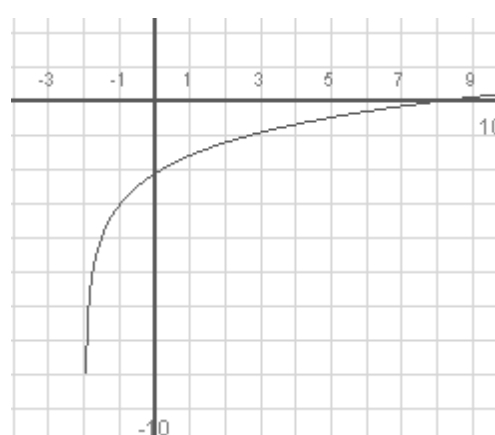
c) $y = (1/2)\log[(1/3)(x)]$

4. Find an equation for each graph: (Use $\log_8 x$ as the parent function, and use shifts only for simplicity)

a)



b)



5. A graph has the following key features:

- Increasing for $x > 0$
- x-intercept of 1
- No y-intercept
- A vertical asymptote of $x = 0$
- Domain: $\{x \mid x > 0, x \in R\}$
- Range: $\{y \in R\}$
- (5, 1) is a point of the graph

A possible function with all these key features is _____.

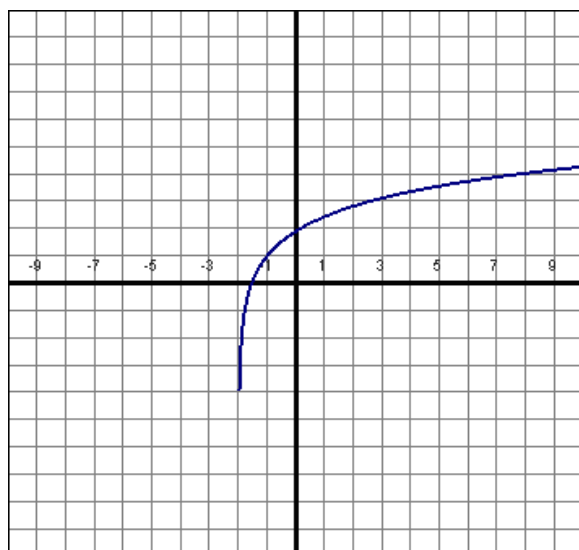
6. A graph has the following key features:

- Decreasing for $x > 0$
- y-intercept of 1
- No x-intercept
- A horizontal asymptote of $y = 0$
- Domain: $\{x \mid x \in R\}$
- Range: $\{y \mid y > 0, y \in R\}$
- (1, 0.5) is a point of the graph

A possible function with all these key features is _____.

Formative Assignment - SOLUTIONS

1. Fill in the key features of the function $f(x)$ defined by the graph below:



Domain	$\{x \in R \mid x > -2\}$
Range	$\{y \in R\}$
x-intercept	$x = -1.5$
y-intercept	$y = 2$
Intervals of Increase/Decrease	Increasing for $\{x \in R \mid x > -2\}$
Vertical/Horizontal Asymptote	Vertical Asymptote
Equation of Asymptote	$x = -2$

2. Fill in the key features of $g(x)$ defined by the function $g(x) = \log[-3(x + 2)]$:

Domain	$\{x \in R \mid x < -2\}$
Range	$\{y \in R\}$
x-intercept	$x = -2.33$ (for now approximate from a graph using technology)
y-intercept	None
Intervals of Increase/Decrease	Decreasing for $\{x \in R \mid x < -2\}$
Vertical/Horizontal Asymptote	Vertical Asymptote
Equation of Asymptote	$x = -2$

3. Describe the following transformations on $y = \log x$

$$y = 2\log[-2(x - 1)]$$

Vertical stretch of 2; horizontal reflection; horizontal compression of $\frac{1}{2}$; horizontal translation of 1 (right).

$$y = -3\log[(x + 4)] - 5$$

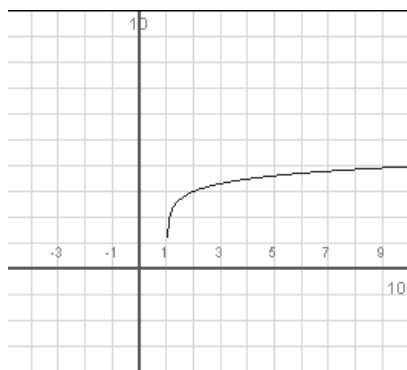
Vertical reflection; vertical stretch of 3; horizontal translation of -4 (left); vertical translation of -5 (down)

$$y = (1/2)\log[(1/3)(x)]$$

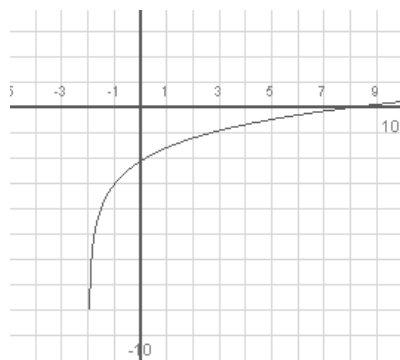
Vertical compression of $\frac{1}{2}$; horizontal stretch of 3

4. Find an equation for each graph:

a) $f(x) = \log_8(x-1) + 3$ Thought process: Looks like VA is at $x=1$, so right shift is $d=1$. Usually log functions cross x axis at 1, because of the shift right by one look at $x=2$ and look for the point that looks to be exactly on the grid. Point $(2, 3)$ is such a point. So instead of crossing the x -axis the function crosses the $y=3$ line, therefore there was a shift up 3.



b) $f(x) = \log_2(x+2) - 3$ Thought process: Looks like VA is at $x=-1$, so left shift makes $d=-2$. Usually log functions cross x axis at 1, because of the shift left by two look at $x=-1$ and look for the point that looks to be exactly on the grid. Point $(-1, -3)$ is such a point. So instead of crossing the x -axis the function crosses the $y=-3$ line, therefore there was a shift down 3.



5. $y = \log_5 x$

6. $y = 0.5^x$