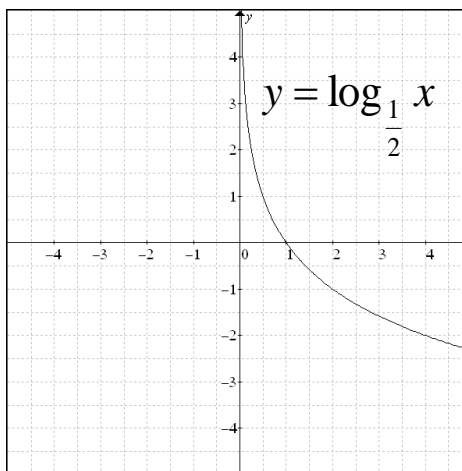
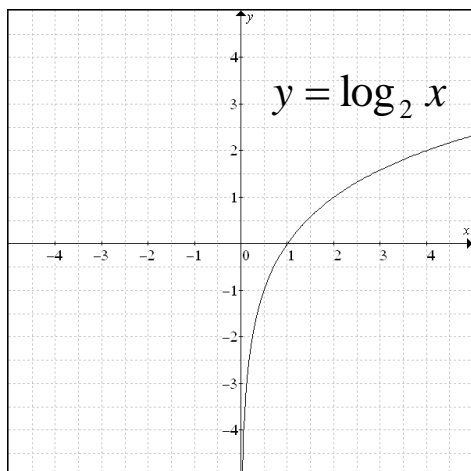


**Recall: Logarithmic Functions**



- The base is positive.
- The  $x$ -intercept=1.
- Vertical asymptote is the  $y$ -axis (i.e.  $x=0$ ).
- Domain:  $x \in \mathfrak{R}, x > 0$ . & Range:  $y \in \mathfrak{R}$
- If  $b > 1$ , the function is increasing.
- If  $0 < b < 1$ , the function is decreasing.

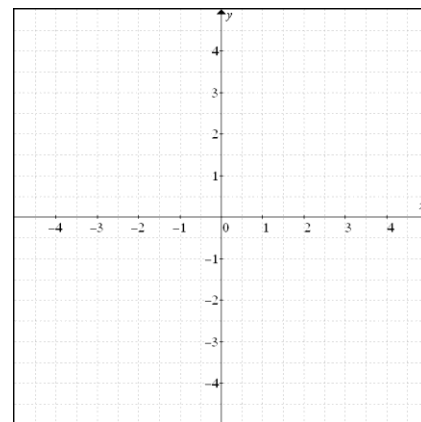
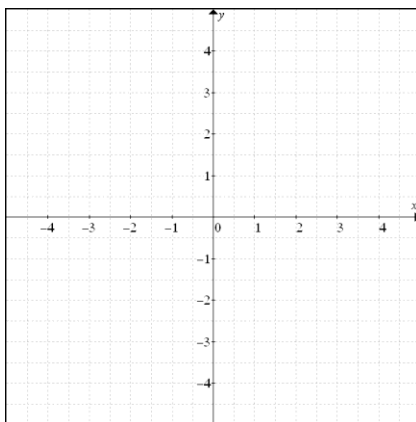
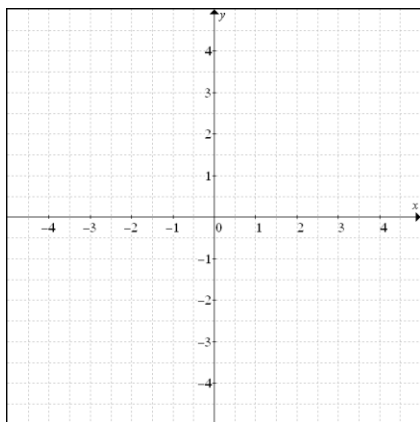
**Example 1**

Sketch each logarithmic function and describe its transformation.

a)  $y = \log_3 x$

b)  $y = \log_3(-x)$

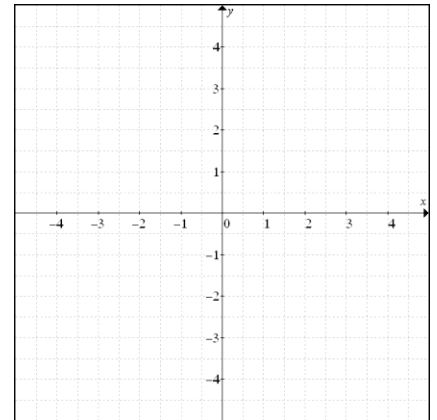
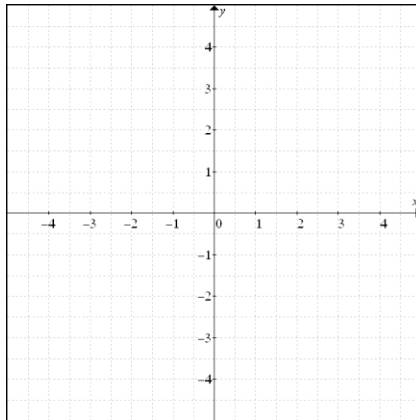
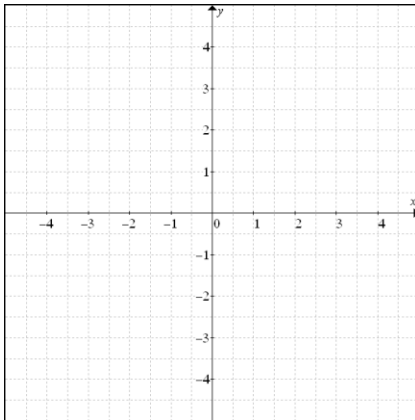
c)  $y = \log_3 x^3$



d)  $y = \log_3(-x)^3$

e)  $y = \log_3 x^2$

f)  $y = \log_3 x^{-4}$



**Homework:**  
Sketching Logarithmic Functions

# Sketching Logarithmic Functions

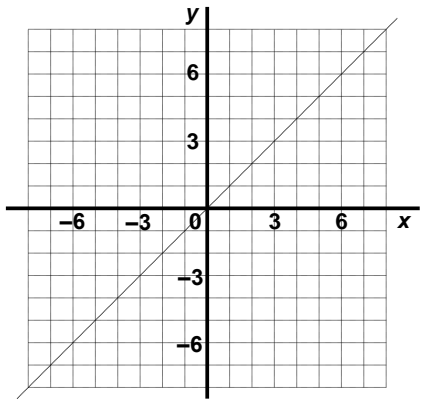
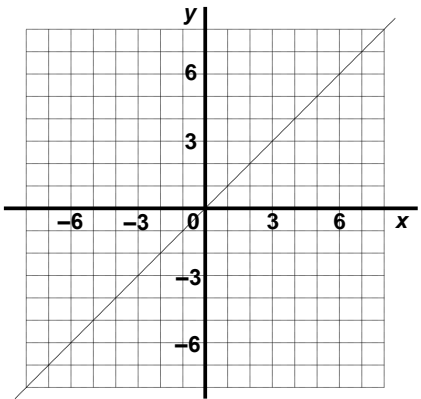
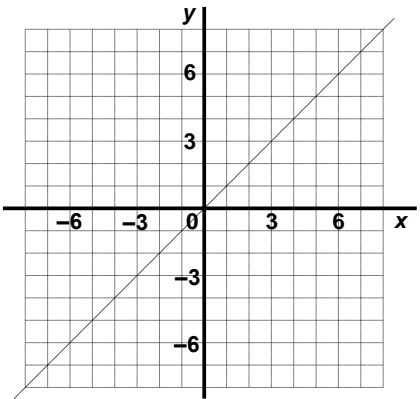
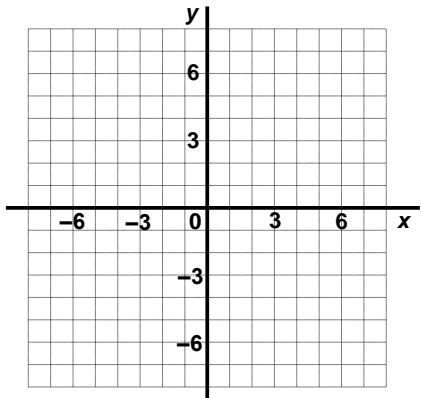
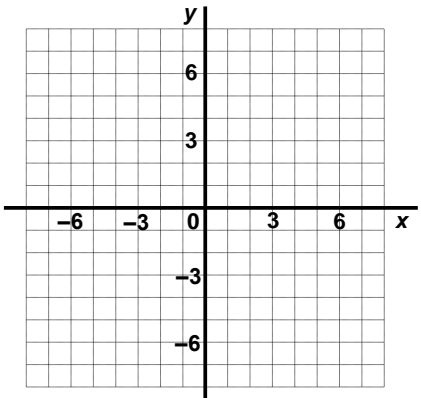
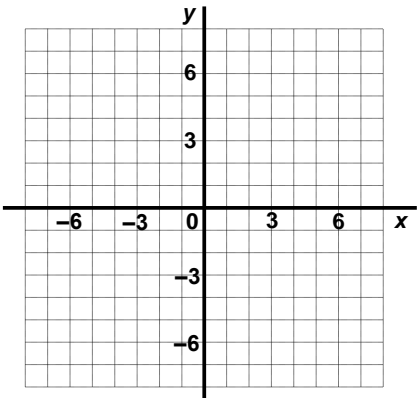
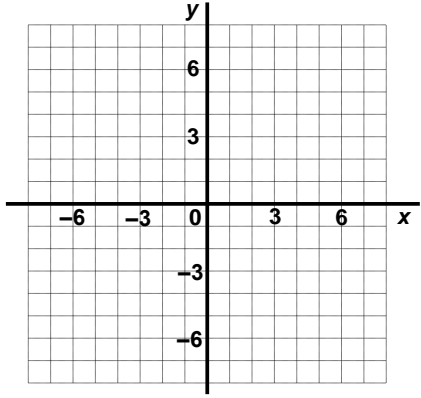
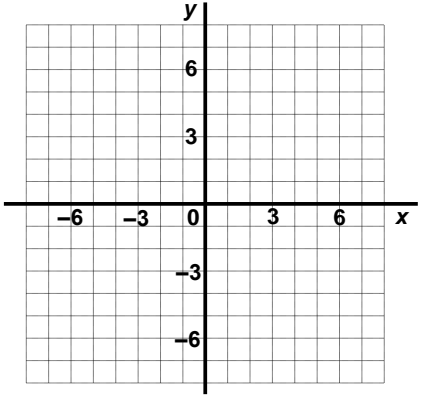
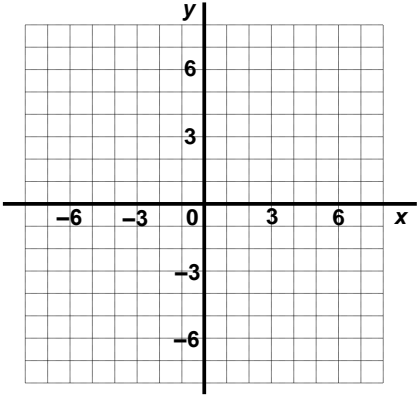
Date: \_\_\_\_\_

For graphs #1 to #3, first graph the basic exponential function which corresponds to the given logarithmic function, then graph the logarithmic function as a reflection in  $y = x$  of the exponential function.

For example, if asked to graph  $y = \log_5 x$ :

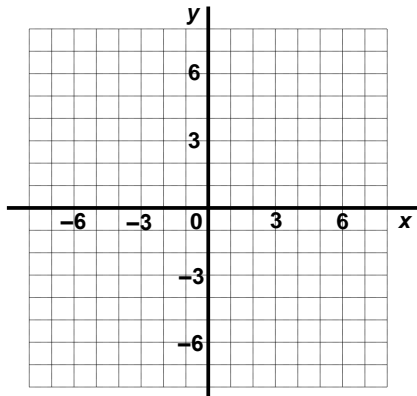
- first graph  $y = 5^x$
- then graph its reflection in  $y = x$ , that is :  $y = \log_5 x$

Since graphs #4 to #15 are all based on graph #1, it is not necessary to sketch the required exponential function for these. Just refer back to your work in graph #1.

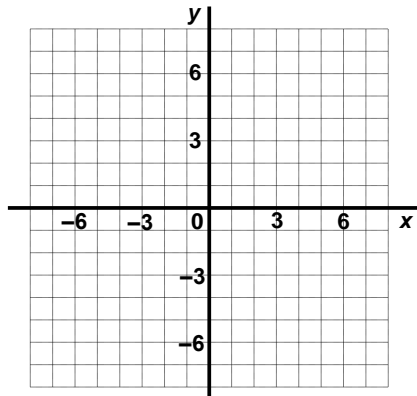
 <p>1. <math>y = \log_2 x</math></p>	 <p>2. <math>y = \log_4 x</math></p>	 <p>3. <math>y = \log_{\frac{1}{4}} x</math></p>
 <p>4. <math>y = 4 \log_2 x</math></p>	 <p>5. <math>y = \log_2 x + 3</math></p>	 <p>6. <math>y = \log_2(x + 2)</math></p>
 <p>7. <math>y = \log_2(x - 1) - 2</math></p>	 <p>8. <math>y = -\log_2 x</math></p>	 <p>9. <math>y = \log_2(-x)</math></p>

Sketching Logarithmic Functions

Date: \_\_\_\_\_

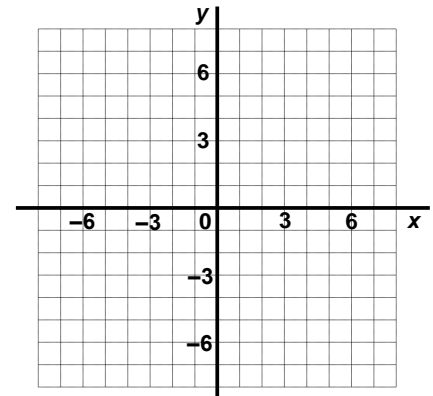


10.  $y = -2\log_2 x$

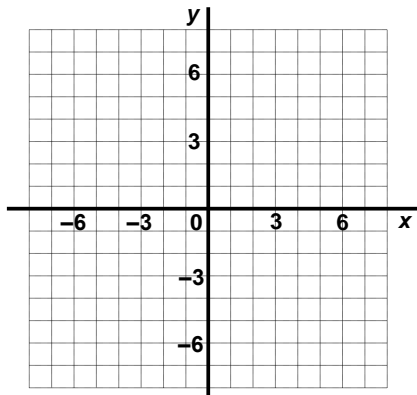


11.  $y = \log_2 x^3$  (Hint: use log law #3.)

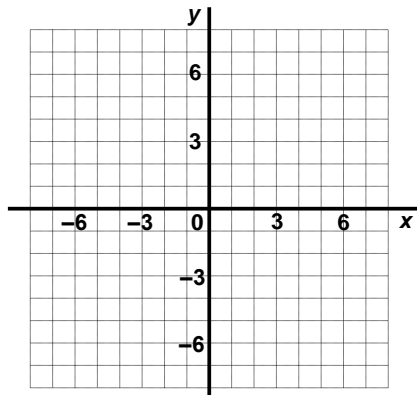
$\therefore y =$



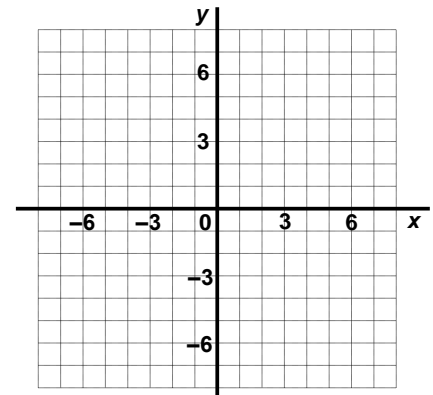
12.  $y = 2\log_2(x+3)$



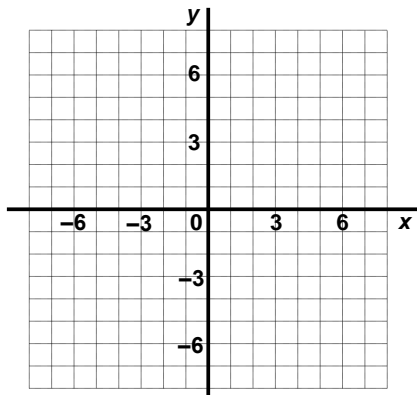
13.  $y = \log_2(-x)^3$



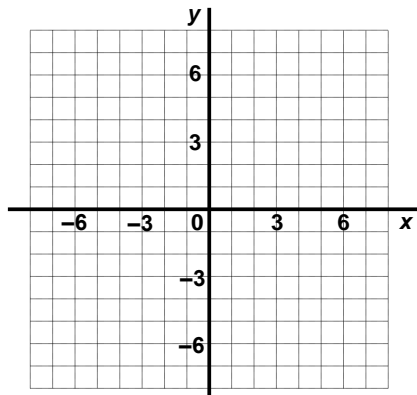
14.  $y = \log_2 x^2$  (Hint: try both positive and negative values of  $x$  — make a table of values and graph from this.)



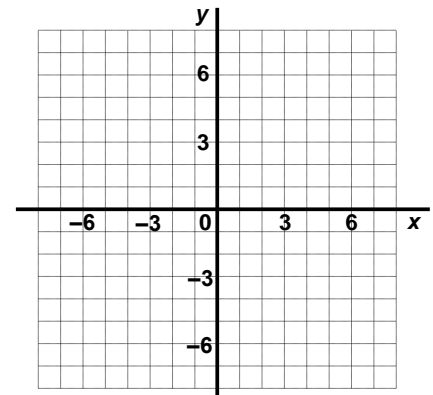
15.  $y = \log_2 x^{-4}$



16.  $y = \log_3 x$

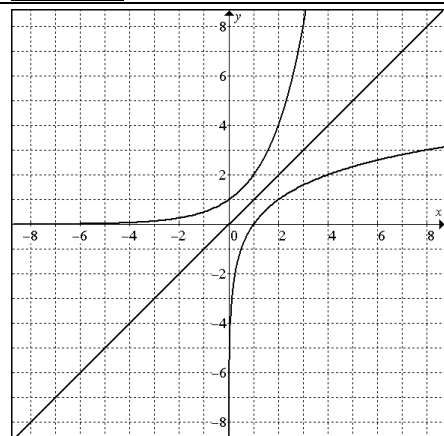


17.  $y = \log_4 x - 3$

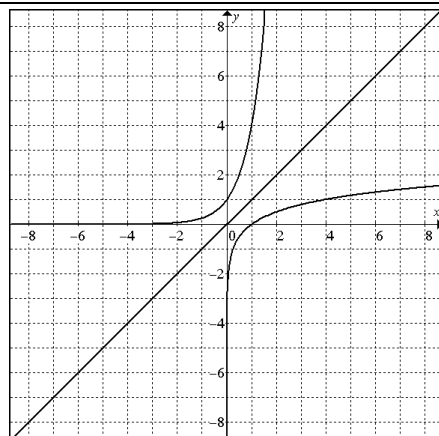


18.  $y = -\frac{1}{2}\log_3 x$

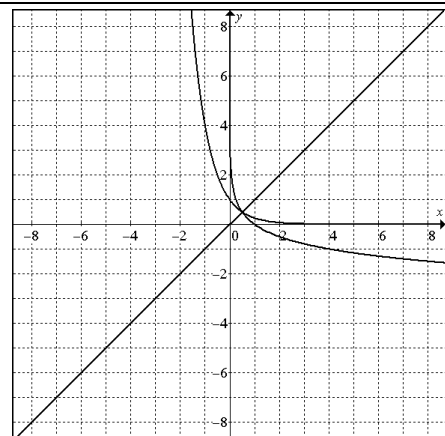
**Answers**



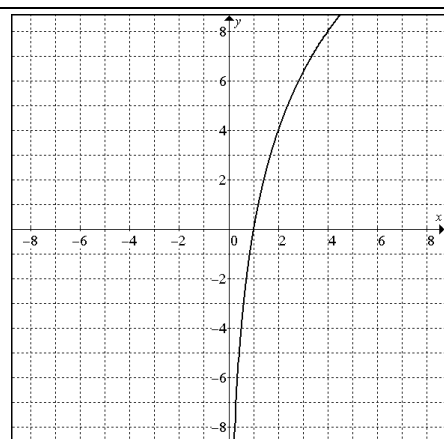
1.  $y = \log_2 x$



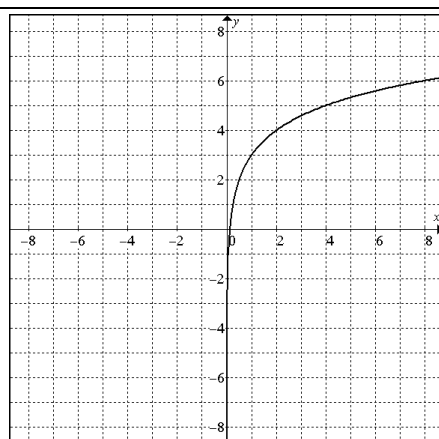
2.  $y = \log_4 x$



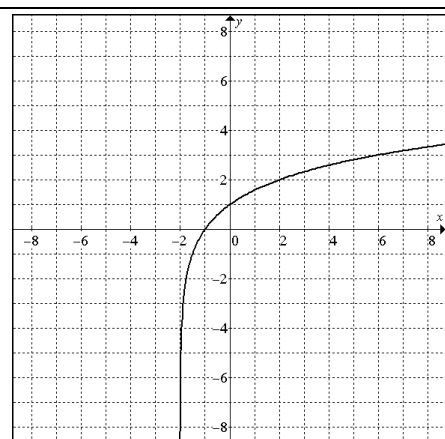
3.  $y = \log_{0.25} x$



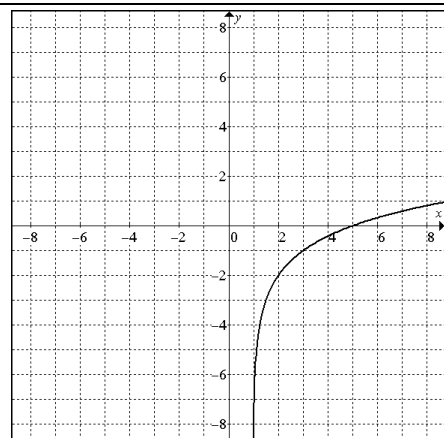
4.  $y = 4 \log_2 x$



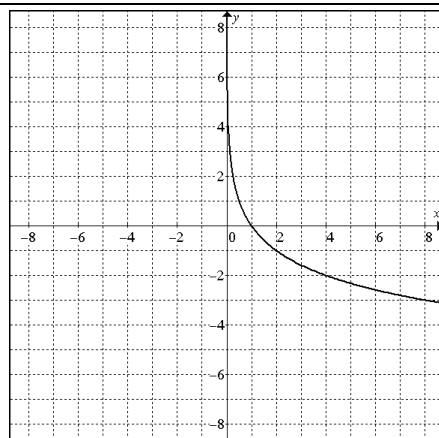
5.  $y = \log_2 x + 3$



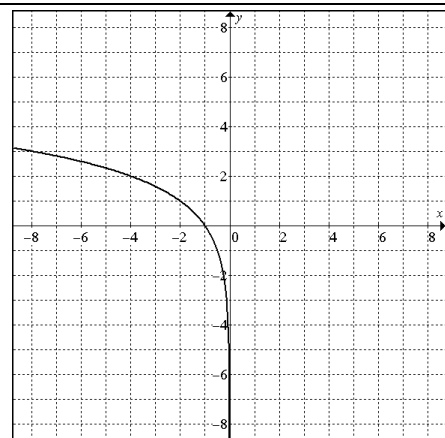
6.  $y = \log_2(x + 2)$



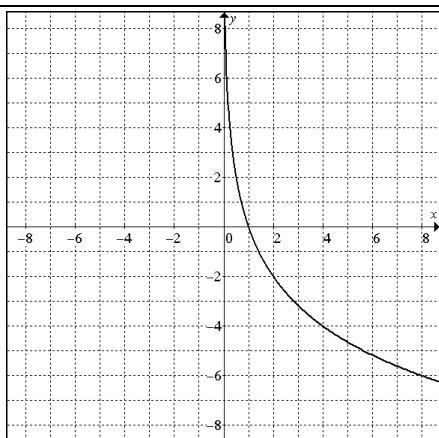
7.  $y = \log_2(x - 1) - 2$



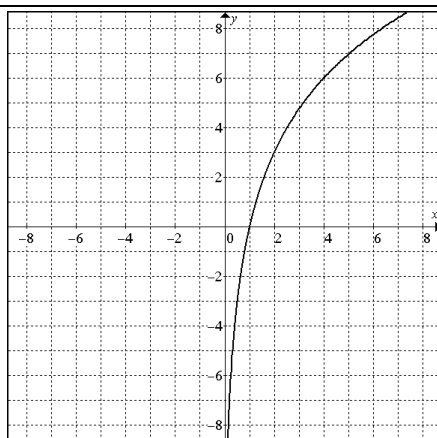
8.  $y = -\log_2 x$



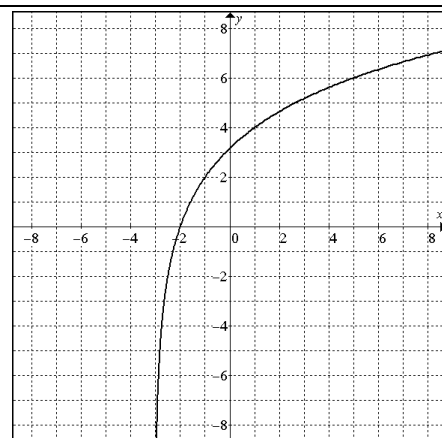
9.  $y = \log_2(-x)$



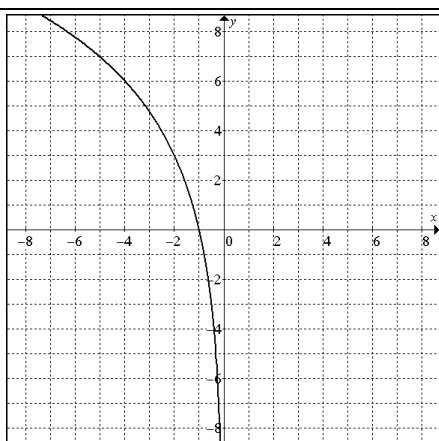
10.  $y = -2\log_2 x$



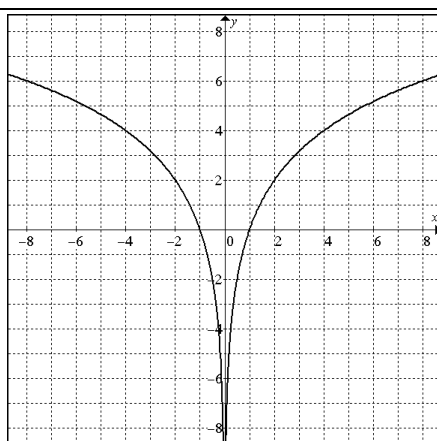
11.  $y = \log_2 x^3$  (Hint: use log law #3.)



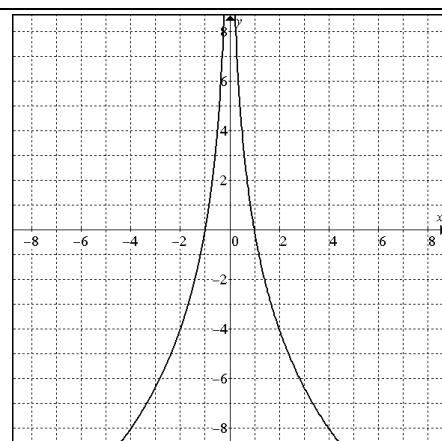
12.  $y = 2\log_2(x + 3)$



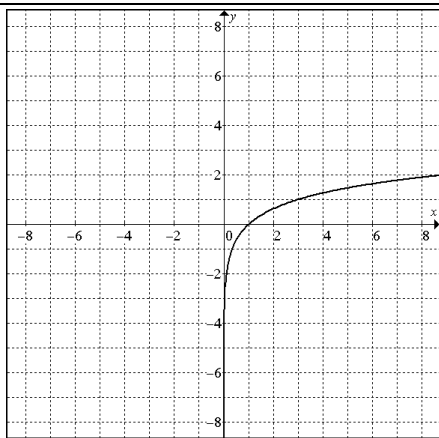
13.  $y = \log_2(-x)^3$



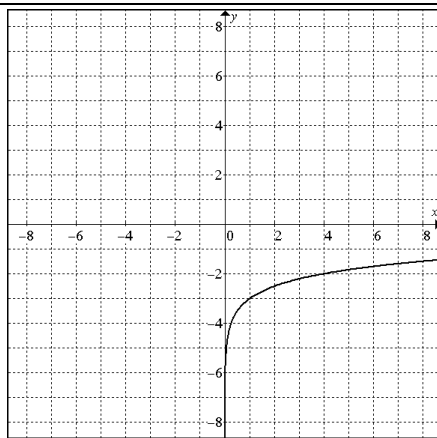
14.  $y = \log_2 x^2$  (Hint: try both positive and negative values of  $x$  — make a table of values and graph from this.)



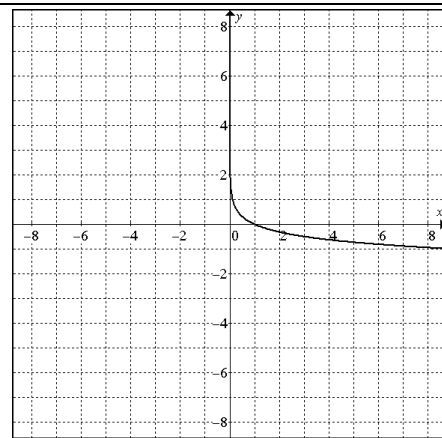
15.  $y = \log_2 x^{-4}$



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