Name: ______________________________ Date: ______________________

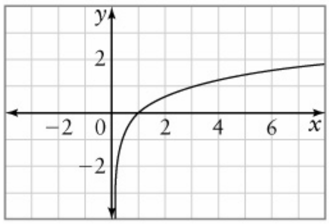
6.3 Transformations of Logarithmic Functions

1. Match the following equations with one of the graphs below.

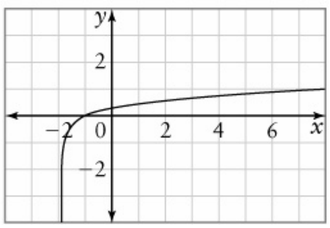
$y = \log(2x)$ $\quad y = \log(x+2)$

$y = 2\log(x)$ $\quad y = \log(x) + 2$

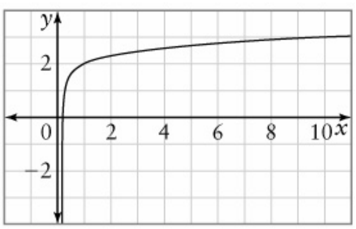
a)



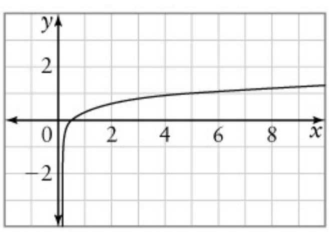
b)



c)



d)



2. Sketch a graph of each function. For each, state the domain and the range.

a) $y = \log x$ **b)** $y = \log x - 2$

c) $y = -2\log x$ **d)** $y = \log(-2x)$

e) $y = \log\left(\frac{1}{2}x\right)$ **f)** $y = \log(x-2)$

3. The growth of a $1000 investment at an interest rate of 6% per year compounded annually can be modelled by the function $n(A) = 40\log A - 120$, where n is the number of years needed to grow to A dollars.

a) Use the formula to calculate the number of years needed for the investment to

i) double to $2000

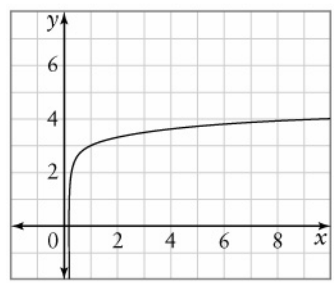
ii) triple to $3000

b) Sketch a graph of n versus A for $0 \le A \le 3000$. Then, use your graph to estimate the value of the investment after 8 years.

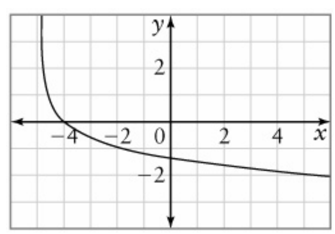
c) In real life there must be a restriction on the domain of this function. What is this restriction? Explain.

4. The following graphs are transformations of the graph of $y = \log x$. Write a possible equation for each.

a)



b)



5. Sketch a graph of each function.

a) $f(x) = -2\log(x+3)$

b) $f(x) = \log[2(x+3)] - 4$

c) $f(x) = 3\log(-(x+3))$

d) $f(x) = \frac{1}{2}\log(2x+6)$

6. Describe how the graph of each function can be obtained using transformations of the graph of $y = \log x$.

a) $y = -\log 2(x+3)$

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

7. Use transformations to explain why $y = -\log(-x)$ and $y = \log x$ are inverses of each other.

8. Use Technology

a) Compare the graphs of each pair of functions.

i) $y = \log x + 1$ and $y = \log 10x$

ii) $y = \log x + 2$ and $y = \log 10^2 x$

iii) $y = \log x + 3$ and $y = \log 10^3 x$

b) Use the pattern from part a) to graph $y = \log 10^4 x$, without using technology.