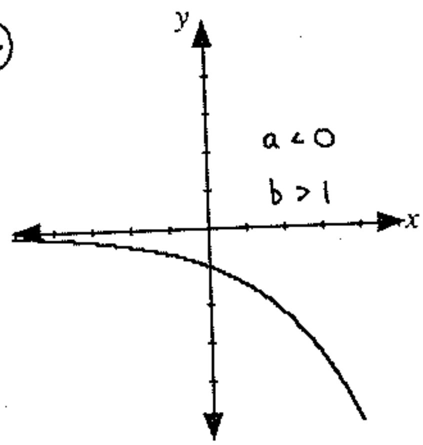
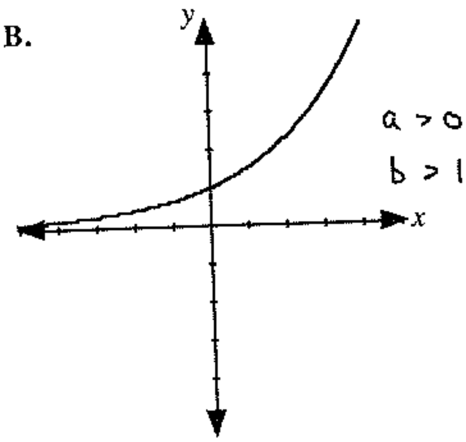
Exponential and Logarithmic Functions Lesson #9: Practice Test

1. The graph that best represents $y = ab^x$, where $a < 0$ and $b > 1$, is

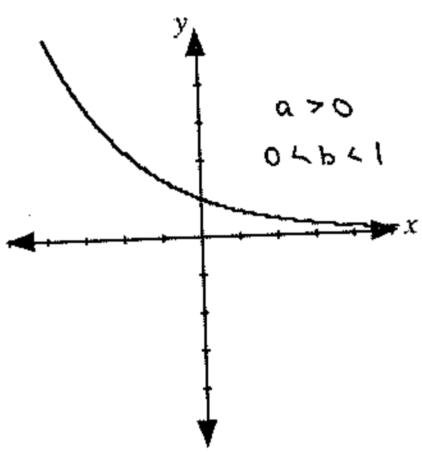
(A.)



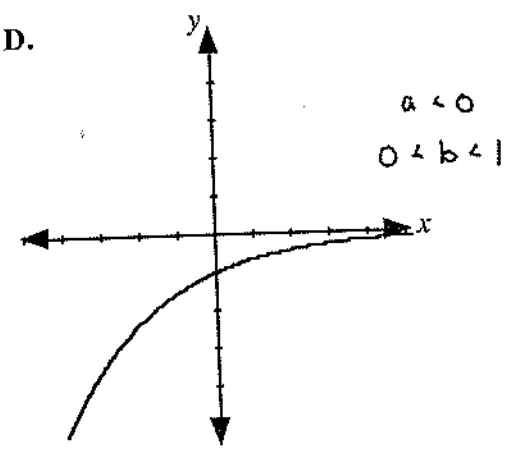
B.



C.



D.



2. Solve for x in the equation $(e^3)^{3x-1} = \left(\sqrt{e}\right)^{4x+6}$.

A. $\frac{9}{7}$

B. 1

(C.) $\frac{6}{7}$

D. $-\frac{5}{7}$

$e^{9x-3} = e^{\frac{1}{2}(4x+6)}$

$e^{9x-3} = e^{2x+3}$

$9x - 3 = 2x + 3$

$7x = 6$

$x = \frac{6}{7}$

3. The equation of the asymptote of the graph of $y = \log(x-5)+6$ is

A. $x=6$

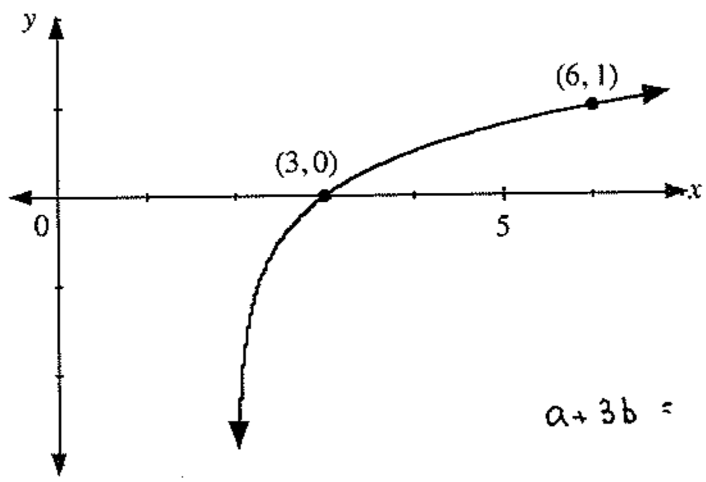
B. $x=5$

C. $x=0$

D. $x=-5$

asymptote of $y = \log x$ is $x = 0$
$y-6 = \log(x-5)$ is a translation of $y = \log x$
5 units right and 6 units down
asymptote $x = 5$

Numerical Response 1. The diagram shows part of the graph of $y = \log_b(x-a)$ where $a, b \in N$.



$(3,0)$ $0 = \log_b(3-a)$
$b^0 = 3-a$
$1 = 3-a$ $a=2$

$(6,1)$ $1 = \log_b(6-2)$
$1 = \log_b 4$
$b = 4$

$a+3b = 2+3(4) = 14$

The value of $a+3b$ is _____.

(Record your answer in the numerical response box from left to right.)

1	4		

Numerical Response 2. If $\frac{p}{q} = 25$, then the value of $\log_6 p - \log_6 q$, to the nearest tenth, is

(Record your answer in the numerical response box from left to right.)

1	.	8	

$\log_6 p - \log_6 q = \log_6\left(\frac{p}{q}\right) = \log_6 25 = \frac{\log 25}{\log 6} = 1.796\ldots$

4. At which of these points is the relation $\log_3(x+1) + \log_3(x-y) = \log_3 6$ **not** defined?

A. $(0,-6)$ $\log_3 1 + \log_3 6$

B. $(2,0)$ $\log_3 3 + \log_3 2$

C. $(5, 4)$ $\log_3 6 + \log_3 1$

D. $(-4,-2)$ $\log_3(-3) + \log_3(-2)$ not defined

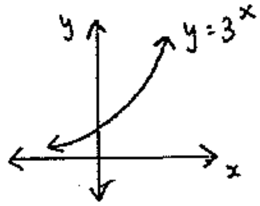
5. The range of the function $f(x) = 3^{x+c} - d$ is

A. $y > c$

B. $y > -d$

C. $y > d$

D. $y > 0$



$y + d = 3^{x+c}$

translation of $y = 3^x$

c units left and d units down

range $y > -d$

6. If $\log_6 y = t$, the value of $\log_6 36y$ is

A. $36t$

B. $t + 36$

C. $2t$

D. $t + 2$

$= \log_6 36 + \log_6 y$

$= 2 + t$

7. Expressed as a single logarithm, $\log P - 4\log Q - \log R$ is

A. $\log \dfrac{P}{Q^4 R}$

B. $\log \dfrac{PR}{4Q}$

C. $\log \dfrac{P}{4QR}$

D. $\log \dfrac{PR}{Q^4}$

$= \log P - \log Q^4 - \log R$

$= \log P - (\log Q^4 + \log R)$

$= \log P - \log(Q^4 R)$

$= \log\left(\dfrac{P}{Q^4 R}\right)$

8. If $\log_6 p = \log_6 q + r$, where $p > 0$ and $q > 0$, then q is equal to

A. $\dfrac{p}{r^6}$

B. $\dfrac{6^3}{p}$

C. $\dfrac{p}{6^r}$

D. $p - r$

$\log_6 p - \log_6 q = r$

$\log_6\left(\dfrac{p}{q}\right) = r$

$\dfrac{p}{q} = 6^r$

$p = q(6^r)$ $\quad q = \dfrac{p}{6^r}$

9. If $3^{\log_2 a + \log_2 6} = \frac{1}{81}$, then a is equal to

A. -10

B. $\frac{1}{486}$

C. $\frac{1}{96}$

D. $\frac{8}{3}$

$3^{\log_2 6a} = 3^{-4}$

$\log_2 6a = -4$

$6a = 2^{-4}$

$6a = \frac{1}{16}$

$a = \frac{1}{96}$

Numerical Response

3. If $\log_b p = 4$ and $\log_b q = 2$, then $\log_b (pq^3)$ is equal to

(Record your answer in the numerical response box from left to right.)

1	0		

$\log_b(pq^3) = \log_b p + \log_b q^3 = \log_b p + 3\log_b q = 4 + 3(2) = 10$

10. The domain of the function $g(x) = 2 + \log_x(10 - x)$ is

A. $x < 10, x \neq 1, x \in R$

B. $x < 12, x \neq 1, x \in R$

C. $0 < x < 10, x \neq 1, x \in R$

D. $2 < x < 12, x \neq 1, x \in R$

base $x > 0$, $x \neq 1$

argument $10 - x > 0$

$10 > x$

$x < 10$

$0 < x < 10, x \neq 1$

11. If $\log_a\left(\frac{1}{16}\right) = -\frac{1}{4}$, then a is equal to

A. 2 **B.** $\frac{1}{2}$

C. $\frac{1}{65\,536}$ **D.** 65 536

$\frac{1}{16} = a^{-\frac{1}{4}}$

$\left(\frac{1}{16}\right)^{-4} = \left(a^{-\frac{1}{4}}\right)^{-4}$

$(16)^4 = a$

$a = 65536$

12. If $\frac{2}{3}\log_n x = 5$, then x^2 is equal to

A. n^{15}

B. 15^n

C. $n^{\frac{20}{3}}$

D. $n^{\frac{5}{3}}$

$\log_n x = 5\left(\frac{3}{2}\right) = \frac{15}{2}$

$x = n^{\frac{15}{2}}$

$x^2 = \left(n^{\frac{15}{2}}\right)^2 = n^{15}$

Numerical Response 4. To the nearest hundredth, the y-intercept, of the graph of $y = \log_5(x+4)$ is ______.

(Record your answer in the numerical response box from left to right.)

0	.	8	6

$x = 0 \quad y = \log_5(0+4) = \log_5 4 = \frac{\log 4}{\log 5} = 0.86..$

13. $12 \log_{64} x - 6 \log_{16} x$ is equivalent to

A. $\log_2 x$

B. $\log_4 x$

C. $\log_{16} x$

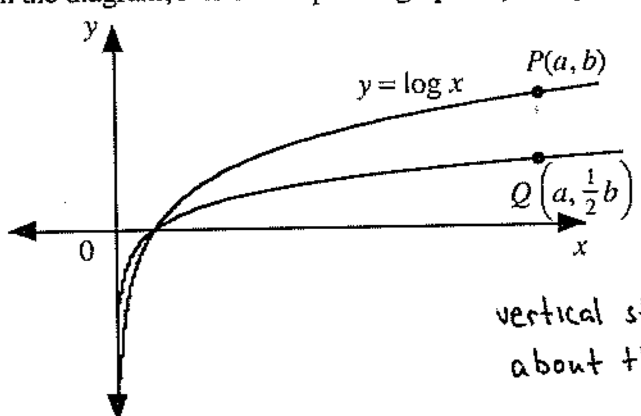
D. $\log_{64} x$

$\log_{64} x = \log_{2^6} x = \frac{1}{6} \log_2 x \qquad \log_4 x = \log_{2^2} x = \frac{1}{2} \log_2 x$

$\log_{16} x = \log_{2^4} x = \frac{1}{4} \log_2 x$

$12 \log_{64} x - 6 \log_{16} x = 12\left(\frac{1}{6}\log_2 x\right) - 6\left(\frac{1}{4}\log_2 x\right) = \frac{1}{2}\log_2 x = \log_4 x$

14. In the diagram, P is on the partial graph of $y = \log x$.



vertical stretch by a factor of $\frac{1}{2}$ about the x-axis $\quad y \to 2y$

$2y = \log x, \quad y = \frac{1}{2}\log x, \quad y = \log x^{\frac{1}{2}}$

The point Q is on the partial graph of

A. $y = \log x^{\frac{1}{2}}$ B. $y = (\log x)^{\frac{1}{2}}$ C. $y = \log \frac{1}{2}x$ D. $y = \log x^2$

15. The expression $\log_{\frac{1}{2}} x$ is equivalent to which one or more of the following expressions?

I. $\log_2\left(\frac{1}{x}\right)$ II. $-\log_2 x$

$\log_{\frac{1}{b}} x = -\log_b x$

so $\log_{\frac{1}{2}} x = -\log_2 x$

$= \log_2 x^{-1}$

$= \log_2\left(\frac{1}{x}\right)$

A. I only

B. II only

C. I and II

D. neither I nor II

Numerical Response 5. In the equation $\log_x 64 = \frac{2}{3}$, the value of x, to the nearest whole number, is _____.

(Record your answer in the numerical response box from left to right.)

5	1	2	

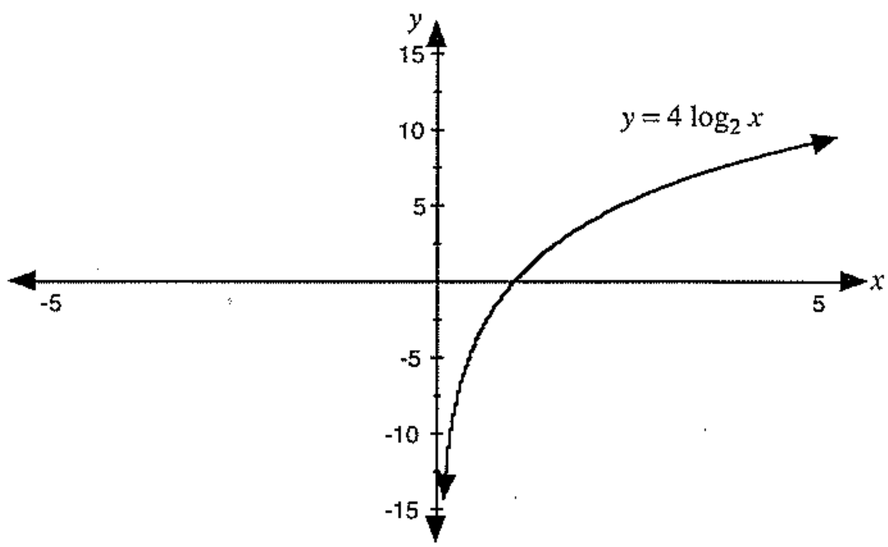
$64 = x^{2/3}$

$(64)^{3/2} = (x^{2/3})^{3/2}$ $512 = x$

Written Response

Students are investigating logarithmic functions with base 2.

- The graph of $y = 4\log_2 x$ is shown.



Complete the table which describes some of the features of the graph of $y = 4\log_2 x$.

Domain	$\{x \mid x > 0, x \in R\}$
Range	$y \in R$
***x*-intercept**	1
***y*-intercept**	none

- Determine, in the form $y = \ldots$, the equation of the inverse of the graph of $y = 4\log_2 x$.

Inverse $x = 4\log_2 y$ $\quad 2^{\frac{x}{4}} = y$ $\quad y = 2^{\frac{x}{4}}$

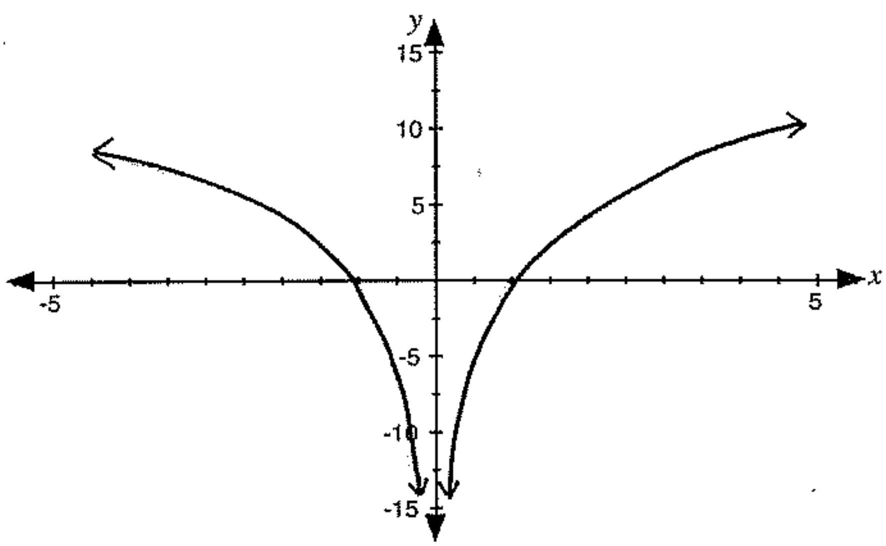
$\frac{x}{4} = \log_2 y$

- A student identifies the following law of logarithms on the formula sheet:

$$\log_a M^n = n\log_a M.$$

The student assumes that, because of this law, the graph of $y = \log_2 x^4$ will be identical to the graph of $y = 4\log_2 x$.

Sketch a partial graph of $y = \log_2 x^4$ on the grid below to show that the student's assumption is **not** correct.



Explain why the difference occurs.

The domain of $y = 4\log x$ is $x > 0,\ x \in R$

The domain of $y = \log x^4$ is $x \neq 0,\ x \in R$

- If $\log_2 x = P$, write expressions for $\log_{\frac{1}{2}} x$, $\log_2 x^2$, and $\log_8 x$.

$\log_{\frac{1}{2}} x = -\log_2 x = -P$ $\qquad \log_8 x = \log_{2^3} x = \frac{1}{3}\log_2 x = \frac{1}{3}P$

$\log_2 x^2 = 2\log_2 x = 2P$