Assignment

1. Complete the following from the graphs of $y = b^x$ and $y = \log_b x$, $b > 0$.

Function	Domain	Range	x-intercept	y-intercept	Asymptote
$y = b^x$	$x \in R$	$y \mid y > 0, y \in R$	none	1	$y = 0$
$y = \log_b x$	$x \mid x > 0, x \in R$	$y \in R$	1	none	$x = 0$

2. Why does x have to be greater than zero in the domain of $y = \log_b x$, and not in $y = b^x, b > 0$?

$y = \log_b x \Rightarrow x = b^y$; since $b > 0$, $b^y > 0$ + so x must be > 0

$y = b^x$ can be determined for all values of x – positive/negative or zero.

3. Express each of the following in logarithmic form.

a) $5^2 = 25$

$\log_5 25 = 2$

b) $3^0 = 1$

$\log_3 1 = 0$

c) $2^{-4} = \frac{1}{16}$

$\log_2 \left(\frac{1}{16}\right) = -4$

d) $\left(\frac{1}{2}\right)^4 = \frac{1}{16}$

$\log_{\frac{1}{2}} \left(\frac{1}{16}\right) = 4$

e) $b^d = e$

$\log_b e = d$

4. Express each of the following in exponential form.

a) $\log_3 9 = 2$

$9 = 3^2$

b) $\log_5 625 = 4$

$625 = 5^4$

c) $\log_4 \frac{1}{4} = -1$

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

d) $\log_a f = i$

$f = a^i$

e) $\log_{10} 0.001 = -3$

$0.001 = 10^{-3}$

5. Is $y = \log_3 x$ the logarithmic form of $y = 3^x$? Explain your answer.

No - it is inverse, the log form of $y = 3^x$ is $x = \log_3 y$.

6. Complete the following table:

Logarithmic Form	Exponential Form	Value of x
$\log_4 x = 2$	$x = 4^2$	16
$\log_{49} 7 = x$	$7 = 49^x$	$\cancel{2}\ \frac{1}{2}$
$\log_x\left(\frac{1}{64}\right) = -3$	$\frac{1}{64} = x^{-3}$	4
$\log_4(x+2) = 2$	$x + 2 = 4^2$	14
$\log_{32} x = \frac{1}{5}$	$x = 32^{\frac{1}{5}}$	2
$\log_{16}\left(\frac{1}{2}\right) = x$	$\frac{1}{2} = 16^x$	$-\frac{1}{4}$

7. By converting to exponential form, solve the equation $\log_2(\log_2(x-7)) = 3$.

$\log_2(x-7) = 2^3$

$\log_2(x-7) = 8$

$x - 7 = 2^8$

$x - 7 = 256$

$x = 263$

8. Determine the inverse of the following functions. Answer in the form $y =$ ________.

a) $y = 3^x$

inverse $x = 3^y$

$y = \log_3 x$

b) $y = \log_4 x$

inverse $x = \log_4 y$

$y = 4^x$

c) $y = 3x^2 + 2$

inverse: $x = 3y^2 + 2$

$3y^2 = x - 2$ $\quad y^2 = \frac{x-2}{3}$ $\quad y = \pm\sqrt{\frac{x-2}{3}}$

d) $y = \log_3 x$

inverse: $x = \log_3 y$

$y = 3^x$

e) $y = 20^x$

inverse: $x = 20^y$

$y = \log_{20} x$

f) $x = 20^y$

inverse: $y = 20^x$

9. Change each of the following from exponential form to logarithmic form.

a) $y = 3(2)^x$

$\frac{y}{3} = 2^x$

$\log_2\left(\frac{y}{3}\right) = x$

b) $y = 10(3)^x$

$\frac{y}{10} = 3^x$

$\log_3\left(\frac{y}{10}\right) = x$

c) $y = \frac{5}{6}(10)^x$

$\frac{6}{5}y = 10^x$

$\log_{10}\left(\frac{6}{5}y\right) = x$

d) $a = b(c)^d$

$\frac{a}{b} = c^d$

$\log_c\left(\frac{a}{b}\right) = d.$

10. Change each of the following from logarithmic form to exponential form $y = ab^x$.

a) $\log_8\left(\frac{y}{9}\right) = x$ **b)** $\log_{20}(6y) = x$ **c)** $\log_e\left(\frac{y}{5}\right) = x$ **d)** $\log_{10}(0.5y) = x$

$\frac{y}{9} = 8^x$

$y = 9(8^x)$

$6y = 20^x$

$y = \frac{1}{6}(20^x)$

$\frac{y}{5} = e^x$

$y = 5(e^x)$

$0.5y = 10^x$

$y = 2(10^x)$

11. By converting to exponential form, solve the following equations for y.

a) $3 = \log_2\left(\frac{y}{4}\right)$ **b)** $\log_2\left(\frac{y}{5}\right) = -3$ **c)** $2 = \log_4 32y$

$\frac{y}{4} = 2^3$

$y = 4 \cdot 2^3$

$\underline{y = 32}$

$\frac{y}{5} = 2^{-3}$

$y = 5 \cdot 2^{-3}$

$\underline{y = \frac{5}{8}}$

$32y = 4^2$

$y = \frac{1}{32} \cdot 4^2$

$y = \frac{16}{32}$

$\underline{y = \frac{1}{2}}$

Multiple Choice **12.** If $\log_4(4096x) = 64$, then the value of x is

A. $4^{\frac{32}{3}}$

B. 4^{58}

C. 4^6

D. 4^{32}

$4096x = 4^{64}$

$4^6 x = 4^{64}$

$x = \frac{4^{64}}{4^6}$

$x = 4^{58}.$

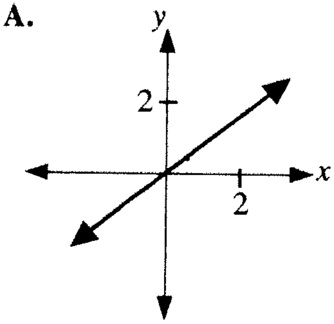
13. The graph of $\log_x y = 1$ is

$y = x^1$

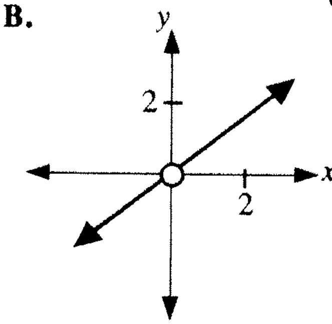
$y = x.$

$\sim y > 0$
$+$
$x > 0$

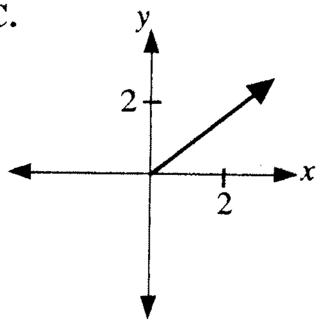
A.



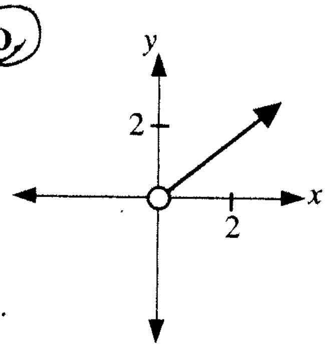
B.



C.



D.



Numerical Response **14.** To the nearest tenth, the y-intercept of the graph of $\log_5(y+2) = x + 1$ is ______.
(Record your answer in the numerical response box from left to right.)

3	.	0	

$x = 0$ $\log_5(y+2) = 0 + 1$

$y + 2 = 5^1$

$y + 2 = 5$

$y = 3$

15. If $\log_b 81 = \frac{2}{3}$, then the value of b is to the nearest whole number is ______.
(Record your answer in the numerical response box from left to right.)

7	2	9	

$b^{2/3} = 81$

$b^{2/3 \cdot 3/2} = 81^{3/2}$

$= (\sqrt{81})^3$

$b = 9^3$

$b = 729$