Section 6.4 Logarithmic Functions

#1 - 11: Write the equation in logarithmic form.

1) $3^2 = 9$

2) $2^3 = 8$

3) $3^4 = 81$

4) $2^5 = 32$

5) $3^{-1} = \frac{1}{3}$

6) $4^{-2} = \frac{1}{16}$

7) $e^y = x$

8) $e^0 = 1$

9) $e^3 = 20.09$

10) $e^2 = 7.39$

11) $e^1 = 2.72$

#12 - 26: Write the equation in exponential form.

12) $\log_2 8 = 3$

13) $\log_3 81 = 4$

14) $\log_2 16 = 4$

15) $\log_2 64 = 6$

16) $\log_5 1 = 0$

17) $\log_6 6 = 1$

18) $\log_3 x = 2$

19) $\log x = 3$

20) $\log x = 4$

21) $\ln(x) = 1$

22) $\ln(x) = 0$

23) $\ln(2x) = w$

24) $\ln(e) = 1$

25) $\ln(e^2) = 2$

26) $\ln(e^3) = 3$

#27 - 56: Find the logarithm value without using a calculator.

27) $\log_2 2$

28) $\log_2 1$

29) $\log_7 7$

30) $\log_3 3$

31) $\log_3 1$

32) $\log_3 9$

33) $\log_4 1$

34) $\log_4 4$

35) $\log_4 64$

36) $\log_5 1$

37) $\log_5 5$

38) $\log_5 125$

39) $\log 1$

40) $\log 10$

41) $\log 100$

42) $\log_2 32$

43) $\log_2 128$

44) $\log_3 243$

45) $\log_2 2^3$

46) $\log_3 3^4$

47) $\log_5 5^6$

48) $\log_7 7^8$

49) $\log_4 4^5$

50) $\log_2 2^9$

51) $\ln(e)$

52) $\ln(e^2)$

53) $\ln(e^3)$

54) $\ln(1)$

55) $\ln(e^{-2})$

56) $\ln(e^{-3})$

#57 - 65: Use a calculator to approximate the logarithms. Round to 4 decimal places.

57) log 6

58) log 5

59) $log\ \frac{1}{3}$

60) $log\left(\frac{1}{120}\right)$

61) $\log(5^{-3})$

62) $log(4^{-2})$

63) ln(7)

64) ln(3)

65) $\ln(2^4)$

#66-71 (graphs of common logarithmic functions)

a) Graph the logarithmic functions. First write the equation in exponential form, then create a table of values and plot the points.

b) State the domain of each function.

66) $y = \log_2 x$

67) $y = \log_3 x$

68) $y = \log_4 x$

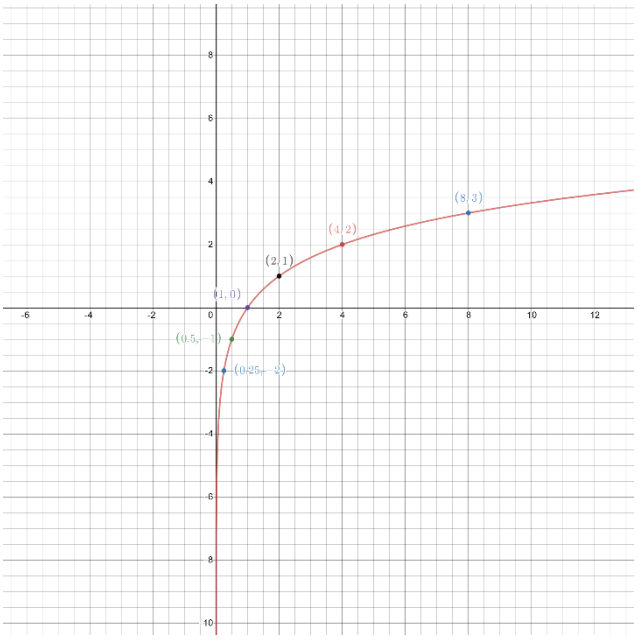
69) y = ln(x)

70) $y = log_{1/2}x$

71) $y = log_{1/3}x$

#72- 83: Let $f(x) = \log_2(x)$

Here is a graph of $f(x) = \log_2(x)$ to help you out



Here are the points that are marked

x	f(x)
.25	-2
.5	-1
1	0
2	1
4	2

a) Find the requested function.
b) State the domain of each function.
c) Describe the transformation the occurs from a common function
d) Graph the logarithmic functions

72) f(x + 2)

73) f(x + 1)

74) f(x – 3)

75) f(x – 2)

76) f(x) + 1

77) f(x) + 2

78) $f(x) - 1$

79) f(x) - 2

80) -f(x)

81) f(-x)

82) 2f(x)

83) 3f(x)

Logarithm Value	Justification
$log_2(-1) = non\ real\ number$	$2^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_2(0) = does\ not\ exist$	$2^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_2(1) = 0$	$2^0 = 1$
$log_2(2) = 1$	$2^1 = 2$
$log_2(4) = 2$	$2^2 = 4$
$log_2(8) = 3$	$2^3 = 8$
$log_2(16) = 4$	$2^4 = 16$
$log_2(32) = 5$	$2^5 = 32$
$log_2(64) = 6$	$2^6 = 64$
$log_2(128) = 7$	$2^7 = 128$
$log_2(256) = 8$	$2^8 = 256$

Logarithm Value	Justification
$log_3(-1) = non\ real\ number$	$3^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_3(0) = does\ not\ exist$	$3^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_3(1) = 0$	$3^0 = 1$
$log_3(3) = 1$	$3^1 = 3$
$log_3(9) = 2$	$3^2 = 9$
$log_3(27) = 3$	$3^3 = 27$
$log_3(81) = 4$	$3^4 = 81$
$log_3(243) = 5$	$3^5 = 243$

Logarithm Value	Justification
$log_4(-1) = non\ real\ number$	$4^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_4(0) = does\ not\ exist$	$4^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_4(1) = 0$	$4^0 = 1$
$log_4(4) = 1$	$4^1 = 4$
$log_4(16) = 2$	$4^2 = 16$
$log_4(64) = 3$	$4^3 = 64$

Logarithm Value	Justification
$log_5(-1) = non\ real\ number$	$5^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_5(0) = does\ not\ exist$	$5^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_5(1) = 0$	$5^0 = 1$
$log_5(5) = 1$	$5^1 = 3$
$log_5(25) = 2$	$5^2 = 25$
$log_5(125) = 3$	$5^3 = 125$

Logarithm Value	Justification
$log_6(-1) = non\ real\ number$	$6^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_6(0) = does\ not\ exist$	$6^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log_6(1) = 0$	$6^0 = 1$
$log_6(6) = 1$	$6^1 = 6$
$log_6(36) = 2$	$6^2 = 36$
$log_6(216) = 3$	$6^3 = 216$

Logarithm Value	Justification
$log(-1) = non\ real\ number$	$10^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log(0) = does\ not\ exist$	$10^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$log(1) = 0$	$10^0 = 1$
$log(10) = 1$	$10^1 = 10$
$log(100) = 2$	$10^2 = 100$
$log(1000) = 3$	$10^3 = 1000$

Logarithm Value	Justification
$ln(-1) = non\ real\ number$	$e^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$ln(0) = does\ not\ exist$	$e^{any\ real\ number\ power} = a\ number\ greater\ than\ 0$
$lm(1) = 0$	$e^0 = 1$
$ln(e) = 1$	$e^1 = e$
$ln(e^2) = 2$	$e^2 = e^2$
$\ln(e^3) = 3$	$e^3 = e^3$
In general $\ln(e^n) = n$	$e^n = e^n$

RULES that you should notice from the tables:

1) $log_b(any\ negative\ number) = not\ a\ real\ number$

2) $log_b(0) = doesn\ not\ exist$

3) $log_b(1) = 0$

4) $log_b(b) = 1$