

Key

Problem Set 5.4

Rewrite the equation in exponential form.

1) $\log_7 49 = 2$

$7^2 = 49$

2) $\log_5 125 = 3$

$5^3 = 125$

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

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

4) $\log_2 16 = 4$

$2^4 = 16$

5) $\log_{16} 4 = \frac{1}{2}$

$16^{1/2} = 4$

6) $\log_3 \frac{1}{9} = -2$

$3^{-2} = 1/9$

Rewrite the equation in logarithmic form.

7) $13^2 = 169$

$\log_{13} 169 = 2$

8) $9^{3/2} = 27$

$\log_9 27 = 3/2$

9) $4^{-3} = \frac{1}{64}$

$\log_4 (1/64) = -3$

10) $10^{-3} = 0.001$

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

11) $64^{1/2} = 8$

$\log_{64} 8 = 1/2$

12) $9^{-2} = \frac{1}{81}$

$\log_9 (1/81) = -2$

13) $12^2 = 144$

$\log_{12} 144 = 2$

14) $(\frac{1}{12})^2 = \frac{1}{144}$

$\log_{(1/12)} (1/144) = 2$

Evaluate the logarithm without using a calculator. Show work to support your answer.

15) $\log_9 81 = 2$

$9^x = 81$

16) $\log_{27} 3 = 1/3$

$27^x = 3$

17) $\log_4 32 = 5/2$

$4^x = 32$

18) $\log_8 1 = 0$

$8^x = 1$

19) $\ln e^4 = 4$

$\log_e e^4 = 4$

20) $\log_8 4 = 2/3$

$8^x = 4$

21) $\log_3 \frac{1}{3} = -1$

$3^x = \frac{1}{3}$

22) $\log 1000 = 3$

$10^x = 1000$

23) $\log_{1/2} 128 = -7$

$(1/2)^x = 128$

24) $\log_4 2 = 1/2$

$4^x = 2$

25) $\log_{25} 125 = 3/2$

$25^x = 125$

26) $\log_3 \frac{1}{243} = -5$

$3^x = \frac{1}{243}$

27) $\log_4 64 = 3$

$4^x = 64$

28) $\log_{64} 4 = 1/3$

$64^x = 4$

29) $\log_6 \frac{1}{216} = -3$

$6^x = \frac{1}{216}$

30) Circle the points which are on the graph of the given logarithmic functions. Show your work.

a) $y = 2\log_3(x - 4) + 5$

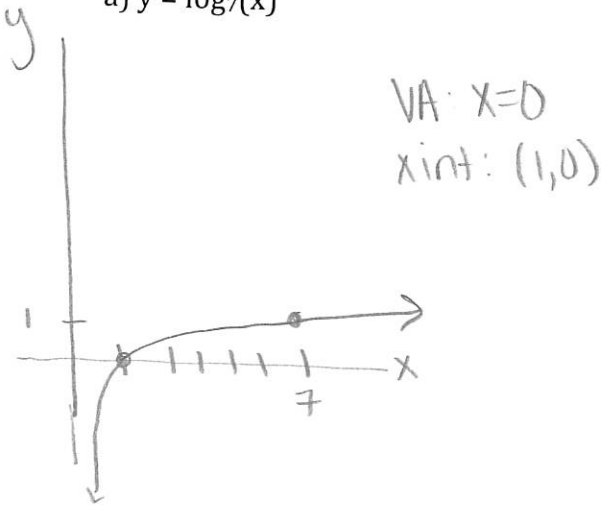
$(5, 3)$ $(7, 7)$ $(13, 9)$
 $3 = 2\log_3(1) + 5$ $7 = 2\log_3(3) + 5$ $9 = 2\log_3(9) + 5$
 $7 = 2 \cdot 1 + 5 \checkmark$ $9 = 2(2) + 5$
 $9 = 4 + 5 \checkmark$

b) $y = -\log_{1/2}(2x) - 1$

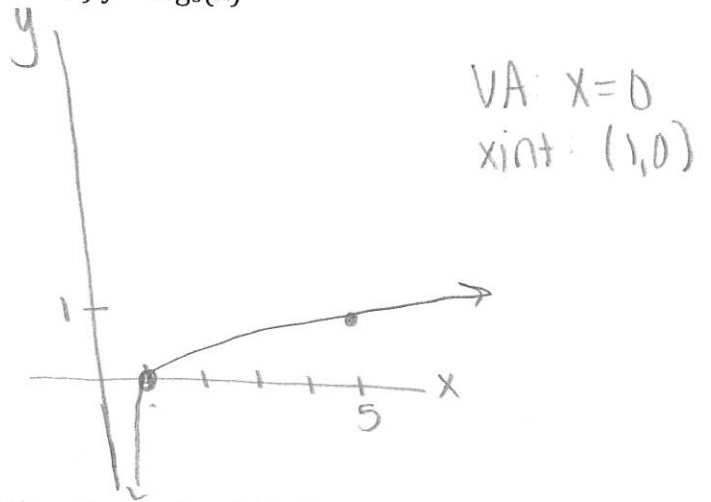
$(4, 2)$ $(8, 3)$ $(16, 5)$
 $2 = -\log_{1/2}(8) - 1$ $3 = -\log_{1/2}(16) - 1$ $5 = -\log_{1/2}(32) - 1$
 $2 = -(-3) - 1$ $3 = -(-4) - 1$ $5 = -(-5) - 1$
 $2 = 3 - 1 \checkmark$ $3 = 4 - 1 \checkmark$ $5 = 5 - 1 \times$

31) Sketch a graph of the logarithmic functions. Note the asymptotes and x-intercept.

a) $y = \log_7(x)$

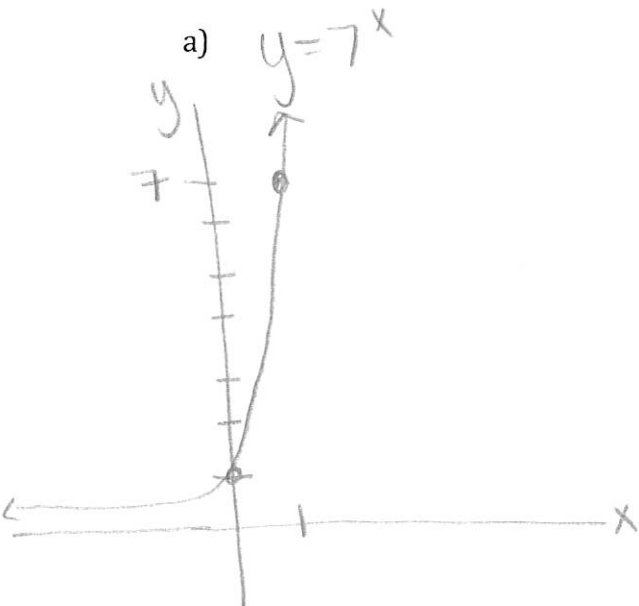


b) $y = \log_5(x)$

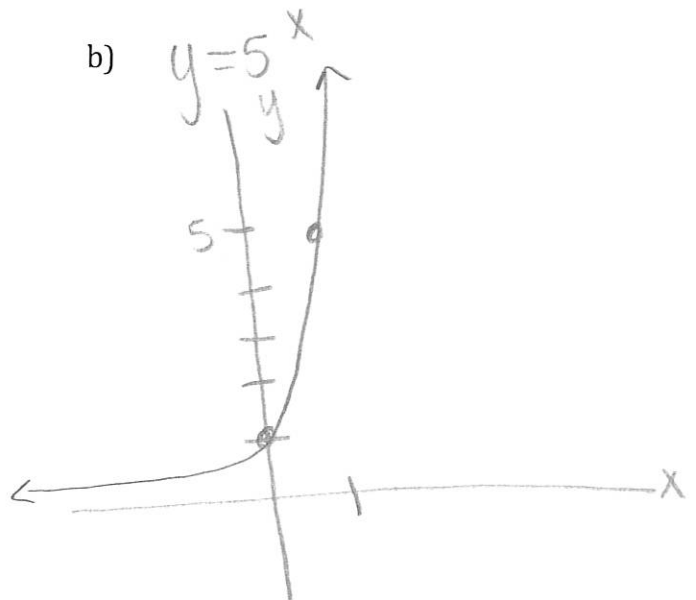


32) What are the inverse functions of the functions in number 31? Sketch the graph of those functions.

a)



b)



33 - 35] Use the definition of the logarithmic function to find x.

33. (a) $\log_5 x = 4$

$$5^4 = x$$
$$\boxed{\log_5 x = 4}$$

(b) $\log_{10} 0.1 = x$

$$10^x = 0.1$$
$$\boxed{x = -1}$$

34. (a) $\log_4 2 = x$

$$4^x = 2$$
$$\boxed{x = 1/2}$$

(b) $\log_4 x = 2$

$$4^2 = x$$
$$\boxed{x = 16}$$

35. (a) $\log_x 1000 = 3$

$$x^3 = 1000$$
$$\boxed{x = 10}$$

(b) $\log_x 25 = 2$

$$x^2 = 25$$
$$\boxed{x = 5}$$

36 - 37] Use the Change of Base Formula and a calculator to evaluate the logarithm, correct to six decimal places. Use either natural or common logarithms.

$$36. \log_2 5 = \frac{\ln 5}{\ln 2} \approx \boxed{2.32193}$$

$$37. \log_5 2 = \frac{\ln 2}{\ln 5} \approx \boxed{0.430677}$$