

$$32.) \quad 46 = 19 - (x+11)^{3/2}$$
$$(-19)^{2/3} = ((x+11)^{3/2})^{2/3}$$
$$27^{2/3} = x+11$$
$$9 = x+11$$
$$-2 = x$$
$$\left(\sqrt[3]{27}\right)^2$$
$$3^2$$

$$\begin{aligned}
 34.) \quad & \left( \sqrt[4]{8x^2 - 1} \right)^4 = (2x)^4 \\
 & 8x^2 - 1 = 16x^4 \\
 & 0 = 16x^4 - 8x^2 + 1 \\
 & 0 = (4x^2 - 1)(4x^2 - 1) \quad \boxed{\frac{1}{2}}
 \end{aligned}$$

$$\begin{aligned}
 & 4x^2 - 1 = 0 \\
 & \sqrt{x^2} = \sqrt{\frac{1}{4}} \quad x = \pm \frac{1}{2}
 \end{aligned}$$

$$\begin{array}{r} 44) \quad -27^{2/3} \\ \quad -1 \cdot 27^{2/3} \\ \quad -1(9) \\ \quad -9 \end{array}$$

## 4.4: Evaluate Logarithms

Definition of Logarithm with base b

$$\log_b y = x \text{ if and only if } b^x = y$$
$$b > 0, \neq 1$$

The expression  $\log_b y$  is read as : "log base b of y"

Logs and Exponential functions are inverses

Rewrite in exponential form

a.)  $\log_3 9 = 2$

$$3^2 = 9$$

b.)  $\log_4 64 = 3$

$$4^3 = 64$$

c.)  $\log_{10} 1 = 0$

$$10^0 = 1$$

Rewrite in logarithmic form

$$a.) 3^5 = 343 \quad \log_3 343 = 5$$

$$b.) 27^{-\frac{2}{3}} = \frac{1}{9} \quad \log_{27} \frac{1}{9} = -\frac{2}{3}$$

$$c.) 10^3 = 1000 \quad \log_{10} 1000 = 3$$
  
$$\log 1000$$

Evaluate

- a)  $\log_4 64 = 3 \quad 4^x = 64$
- b)  $\log_3 81 = 4$
- c)  $\log_7 \frac{1}{7} = -1 \quad 7^x = \frac{1}{7}$
- d)  $\log_{25} 5 = \frac{1}{2} \quad 25^x = 5 \quad \sqrt{25} = 5$
- e)  $\log_3 1 = 0$

$$f.) \log_{81} 27 = \frac{3}{4}$$

$$\begin{array}{rcl} 81^x & = & 27 \\ 3^{4x} & = & 3^3 \end{array}$$

$$(3^4)^x = 3^3$$

$$g.) \log_{32} 128 = \frac{7}{5}$$

$$32^x = 128$$

$$2^{5x} = 2^7$$

## Common Logarithm

$$\log X = \log_{10} X$$

↑  
base 10

a.)  $\log 100 = 2$        $10^2 = 100$

b.)  $\log 1000 = 3$

c.)  $\log 10000 = 4$

d.)  $\log \frac{1}{1000} = -3$

e.)  $\log .01 = -2$

Natural logarithm

$e \approx 2.718$

$$\ln x = \log_e x$$

a.)  $\ln 1 = 0 \quad e^x = 1$

b.)  $\ln e^2 = 2 \quad e^x = e^2$

c.)  $\ln \frac{1}{e} = -1 \quad e^x = \frac{1}{e}$

d.)  $\ln e = 1 \quad e^x = e$

$$\log_7 7 = 1$$

$$\log_{12} \frac{1}{2} = 1$$

$$\log 10 = 1$$

$$\begin{aligned} a^{\log_a b} &= b \\ \log_a a^b &= b \\ \log_2 \frac{1}{16} &= -4 \end{aligned}$$

$$\left| \begin{array}{l} \text{a.) } 2^{\log_2 8} = 8 \\ \text{b.) } 7^{\log_7 17} = 17 \\ \text{c.) } \log_3 3^4 = 4 \\ \text{d.) } \log_{\sqrt{7}} \sqrt[11]{7} = 11 \end{array} \right.$$

Between which 2 consecutive integers does each value lie?

a.)  $\log_2 7$

$$\log_2 4 < \log_2 7 < \log_2 8$$

$$2 < \log_2 7 < 3$$

b.)  $\log 5$

$$\log 1 < \log 5 < \log 10$$

$$0 < \log 5 < 1$$