

3.4 Answer Key

Practice 3.4-1-1:

Find the domain of giving the logarithmic function.

$$f(x) = \log_3(2x - 9)$$

1. Identify the variable:

In the expression $\log_b A$ the variable is **A**.

$$f(x) = \log_3(2x - 9)$$

2. Set the argument of the log greater than 0:

Since the argument of a logarithm must be positive, set: $A > 0$

$$2x - 9 > 0$$

3. Solve for x:

Use algebra or logarithmic rules (if it's an equation) to find the value of **x in the A** that satisfies the expression or equation.

$$2x > 9$$

$$x > \frac{9}{2}$$

Domain: $(\frac{9}{2}, \infty)$

Practice 3.4-2-1:

Converting the following logarithmic equations to exponential equations.

a. $\log_4(R) = Q$

b. $\log(W) = 5$

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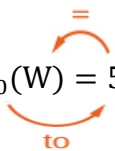


$$4^Q = R$$

b. $\log(W) = 5$

There is an invisible 10 since it is a common logarithm; thus, we can rewrite it as

$\log_{10}(W) = 5$



$$10^5 = W$$

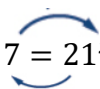
Practice 3.4-2-2:

Converting the following exponential equations to logarithmic equations.

a. $7 = 21^x$

b. $4^w = 13$

a. $7 = 21^x$



$$\log_{21}(7) = x$$

b. $4^w = 13$



$$\log_4(13) = w$$

Practice 3.4-3-1:

Evaluating the logarithmic without using a calculator.

$$y = \log_3\left(\frac{1}{27}\right)$$

Solution:

First, we rewrite the logarithm in exponential form: $3^y = \frac{1}{27}$. Next, we ask, “To what exponent must 3 be raised in order to get $\frac{1}{27}$?”

We know $3^3 = 27$, but what must we do to get the reciprocal, $\frac{1}{27}$? Recall from working with exponents that $b^{-a} = \frac{1}{b^a}$. We use this information to write

$$\begin{aligned} 3^{-3} &= \frac{1}{3^3} \\ &= \frac{1}{27} \end{aligned}$$

Therefore, $\log_3\left(\frac{1}{27}\right) = -3$.

Practice 3.4-4-1:

Solve the logarithmic equation.

$$\log_5(x - 3) = 2$$

1. Translate to an exponential equation.

$$\log_5(x - 3) = 2$$

$$5^2 = x - 3$$

2. Solve for x .

$$5^2 = x - 3$$

$$25 = x - 3$$

$$25 + 3 = x$$

$$28 = x$$

$$x = 28$$

3. Use the domain to check the answer, select the one that fits the domain ($x > 0$).

Based on the domain rule, if $\log_b A$, $A > 0$

Thus, we need to ensure $x - 3 > 0$

Use $x = 28$ substitute x value,

$28 - 3 = 25$, it is positive, which is greater than 0, thus the answer is

$$x = 28$$