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**.

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

b

A

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

Practice 3.4-2-1:

Converting the following logarithmic equations to exponential equations.

a. $\log_4(\mathrm{R}) = \mathrm{Q}$
b. $\log(\mathrm{W}) = 5$

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=

to

$$\mathbf{4^{\mathit{Q}} = \mathit{R}}$$

b. $\log(\mathrm{W}) = 5$

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

=

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

to

$$\mathbf{10^5 = \mathit{W}}$$

Practice 3.4-2-2:

Converting the following exponential equations to logarithmic equations.

a. $7 = 21^x$
b. $4^W = 13$

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

b. $4^W = 13$

$$\mathbf{\log_4(13) = W}$$

Practice 3.4-3-1:

Evaluating the logarithmic without using a calculator.

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

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

$$\mathbf{3^{-3} = \frac{1}{3^3}}$$

$$= \frac{1}{27}$$

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

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

$$\boldsymbol{x = 28}$$