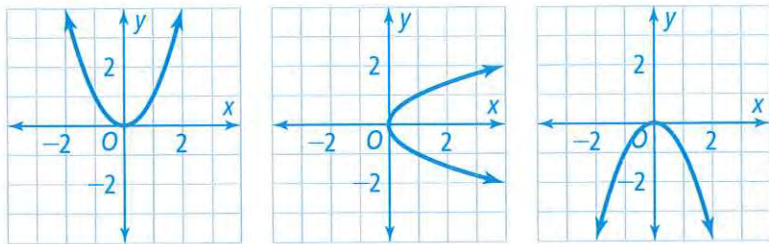


EXPLORE & REASON

Compare the graphs.



A. Which two graphs represent the inverse of each other? Explain.

B. **Look for Relationships** What is the relationship between the domain and the range of the two inverse relations? © MP.7

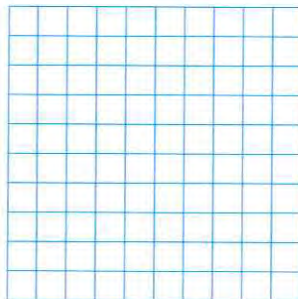
HABITS OF MIND

Communicate Precisely How are the points on graphs of functions that are inverses of each other related? © MP.6

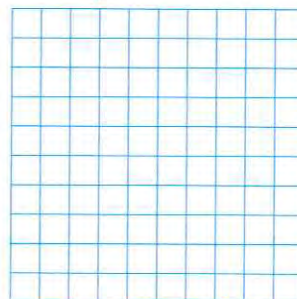
**EXAMPLE 1** **Try It! Identify Key Features of Logarithmic Functions**

1. Graph each function and identify the domain and range. List any intercepts or asymptotes. Describe the end behavior.

a. $y = \ln x$



b. $y = \log_{\frac{1}{2}} x$

**EXAMPLE 2** **Try It! Graph Transformations of Logarithmic Functions**

2. Describe how each graph compares to the graph of $f(x) = \ln x$.

a. $g(x) = \ln x + 4$

b. $h(x) = 5 \ln x$

HABITS OF MIND

Use Structure Does the graph of either $y = \ln x + 4$ or $y = \ln(x + 4)$ have an intercept that is different from the intercept of $y = \ln x$? Explain. © MP.7



EXAMPLE 3  **Try It! Inverses of Exponential and Logarithmic Functions**

3. Find the inverse of each function.

a. $f(x) = 3^{x+2}$

b. $g(x) = \log_7 x - 2$

EXAMPLE 4  **Try It! Interpret the Inverse of a Formula Involving Logarithms**

4. Describe what happens to the amount of monthly revenue as the amount of advertising increases. How might you determine the optimal advertising budget? Explain.

HABITS OF MIND

Generalize How would you explain, in your own words, how to find the inverse of a logarithmic function? © MP.8


EXAMPLE 5  **Try It! Compare Two Logarithmic Functions**

5. For which plane do you think the altitude will change more quickly over the interval $15 \leq t \leq 20$? Explain your reasoning.

HABITS OF MIND

Look for Relationships How does the average rate of change of the function $f(x) = \log x$ change as x increases? © MP.7

Do You UNDERSTAND?

-  **ESSENTIAL QUESTION** How is the relationship between logarithmic and exponential functions revealed in the key features of their graphs?
- Error Analysis** Raynard claims the domain of the function $y = \log_3 x$ is all real numbers. Explain the error Raynard made. © MP.3
- Communicate Precisely** How are the graphs of $f(x) = \log_5 x$ and $g(x) = -\log_5 x$ related? © MP.6

Do You KNOW HOW?

- Graph the function $y = \log_4 x$ and identify the domain and range. List any intercepts or asymptotes. Describe the end behavior.
- Write the equation for the function $g(x)$, which can be described as a vertical shift $1\frac{1}{2}$ units up from the function $f(x) = \ln x - 1$.
- Write the equation for the function $g(x)$, which can be described as a vertical shift $1\frac{1}{2}$ units up from the function $f(x) = \ln x - 1$.
- Write the equation for the function $g(x)$, which can be described as a vertical shift $1\frac{1}{2}$ units up from the function $f(x) = \ln x - 1$.
- The function $y = 5 \ln(x + 1)$ gives y , the number of downloads, in hundreds, x minutes after the release of a song. Find the equation of the inverse and interpret its meaning.

