

## Chapter 6 Review

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## 6.1 The Exponential Function and Its Inverse

1. a) Graph the function  $f(x) = \left(\frac{1}{2}\right)^x$ .

Identify the key features of the graph (domain, range, intercepts, intervals for which the function is positive and intervals for which it is negative, intervals over which the function is increasing and intervals for which it is decreasing, equation of the asymptote).

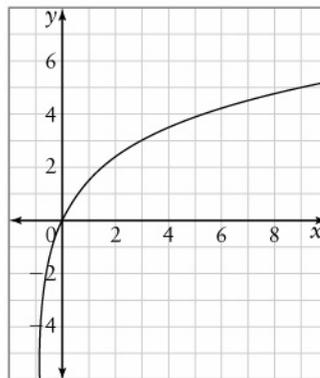
- b) Graph  $f^{-1}$  on the same grid as  $f$  by reflecting the graph of  $f$  in the line  $y = x$ .
- c) Identify the key features of  $f^{-1}$ .

## 6.2 Logarithms

2. Rewrite each equation in logarithmic form.
- a)  $5^4 = 525$     b)  $4^x = 12$     c)  $y = 12^3$
3. Rewrite each equation in exponential form.
- a)  $x = \log 8$
- b)  $4 = \log_5 x$
- c)  $7 = \log_b 200$
4. Evaluate without using a calculator.
- a)  $\log\left(\frac{1}{1000}\right)$     b)  $\log_4 64$
- c)  $\log_2 0.25$     d)  $2^{\log 1000}$
5. a) What is the value of  $x^{\log_x 6}$ ? Justify your answer.
- b) Is your answer to part a) true for all real values of  $x$ ? Explain.

## 6.3 Transformations of Logarithmic Functions

6. a) A graph is produced by applying the following transformations, in order, to the graph of  $y = \log x$ .
- reflection in the  $x$ -axis
  - horizontal stretch by a factor of 2
  - horizontal translation, left 5 units
  - vertical translation, down 3 units
- b) If steps 2) and 3) of the transformations were interchanged, what would the equation of the graph be?
7. Sketch the graph of  $y = -4\log(x+5) - 2$  by hand. Then, check your answer using graphing technology.
8. Determine an equation for the graph shown.



## 6.4 Power Law of Logarithms

9. Evaluate. Avoid using a calculator.
- a)  $\log_4\left(64^{\frac{5}{6}}\right)$     b)  $\log_5\sqrt[5]{\frac{1}{100}}$
10. Solve for  $x$ . Round answers to two decimal places.
- a)  $x = \log_4 25$
- b)  $3^x = 12$
- c)  $15 = x^{7.6}$
- d)  $3000 = 1500(1+x)^8$

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11. The maximum intensity of a signal in a feedback loop is given by the equation  $I(t) = 0.65(1.25)^{2t}$ , where  $I$  is intensity in millivolts and  $t$  is time in seconds.
- What was the original intensity of the signal?
  - In how much time will the intensity be 100 mV, to the nearest tenth of a second?
  - What will be the intensity of the signal after 3.8 s, to the nearest hundredth of a millivolt?

### 6.5 Making Connections: Logarithmic Scales in the Physical Sciences

12. The magnitude,  $M$ , of an earthquake on the Richter scale is given by

$$M = \log\left(\frac{I}{I_0}\right)$$

- The magnitudes of two earthquakes are 4.7 and 7.1. How many times as intense was the stronger earthquake than the less severe one?
- An earthquake is detected that is 450 times as intense as an earthquake with a magnitude of 5.2. What is the magnitude of the new earthquake?

13. The pH of a solution is calculated by using the formula  $\text{pH} = -\log[H^+]$ , where  $[H^+]$  is the concentration of the hydronium ions.
- If the pH of a solution is 4.2, what is the concentration of the hydronium ions?
  - A strong acid has a pH less than 3. If the concentration of the hydronium ions is  $1.6 \times 10^{-4}$  in a particular solution, is the solution a strong acid? Explain.