Chapter 4 Review 2 KEY

Use the composition of functions to determine whether the given functions are inverse functions.

1. $F(x)=\sqrt{x}$ $G(x)=x^2$

yes

2. $p(x)=\frac{x+3}{x}$ $q(x)=\frac{3}{x-1}$

yes

Find the inverse of each function.

3. $f(x)=-2x+3$

$y=-2x+3$

$\frac{y-3}{-2}=\frac{-2x}{-2}$

$-\frac{1}{2}y+\frac{3}{2}=x$

$f^{-1}(x)=-\frac{1}{2}x+\frac{3}{2}$

4. $f(x)=\frac{x}{x+4}$

$(x+4)\ y=\frac{x}{x+4}(x+4)$

$xy+4y=x$

$-xy \quad -xy$

$4y=x-xy$

$\frac{4y}{1-y}=\frac{x(1-y)}{1-y}$

$f^{-1}(x)=\frac{4x}{1-x}$

5. $\{(3,-1),(-5,-17),(0,-7),(4,1),(7,7)\}$

$\{(-1,3),(-17,-5),(-7,0),(1,4),(7,7)\}$

6. $f(x)=\sqrt{5x-4}$

$y^2=(\sqrt{5x-4})^2$

$y^2=5x-4$

$+4 \quad +4$

$\frac{y^2+4}{5}=\frac{5x}{5}$

$f^{-1}(x)=\frac{1}{5}x^2+\frac{4}{5}$

Solve each equation.

7. $\log_3 81 = x$

$X = \frac{\log 81}{\log 3}$

$\boxed{X = 4}$

8. $\ln e^{\pi} = x$

$X = \pi \ln e$

$\boxed{X = \pi}$

9. $5^{x-4} = 625$

$(x-4)\log 5 = \log 625$

$x - 4 = \frac{\log 625}{\log 5}$

$x - 4 = 4$

$\boxed{X = 8}$

10. $\frac{32(2^x)}{32} = \frac{1024}{32}$

$2^x = 32$

$x \ln 2 = \ln 32$

$x = \frac{\ln 32}{\ln 2}$

$\boxed{X = 5}$

11. $10^{\log 2x} = 14$

$\log 2x (\log 10) = \log 14$

$\log 2x = \frac{\log 14}{\log 10}$

$\log 2x = 1.146$

$2x = 10^{1.146}$

$2x = 14$

$\boxed{X = 2}$

Write each equation in its exponential form.

12. $3 = \log_3 27$

$3^3 = 27$

13. $-1 = \log \frac{1}{10}$

$10^{-1} = \frac{1}{10}$

14. $\ln x = 7$

$e^7 = x$

15. $\log_4 (x+2) = 5$

$4^5 = x+2$

Write each equation in its logarithmic form. Assume $y > 0$ and $b > 0$.

16. $2^6 = 64$

$\log_2 64 = 6$

17. $4^{1/2} = 2$

$\log_4 2 = \frac{1}{2}$

18. $90.02 = e^{4.5}$

$\ln 90.02 = 4.5$

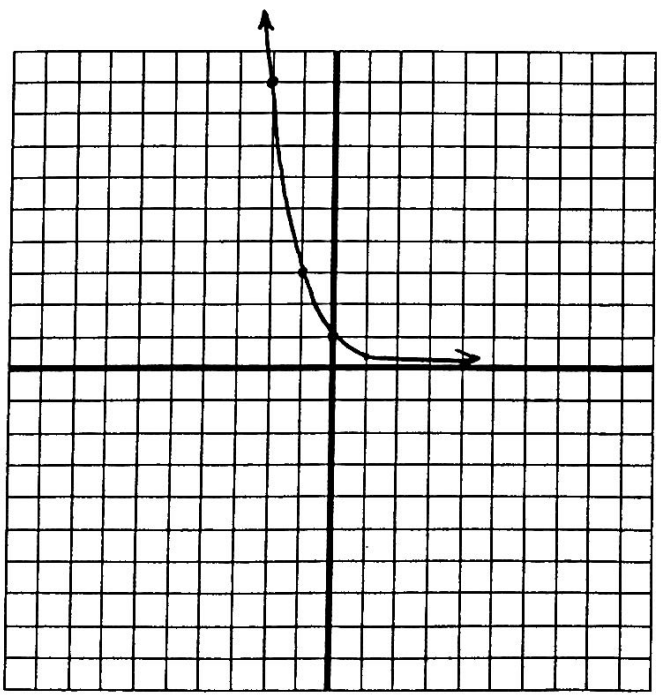
19. $e^{\sqrt{2}} = (x-10)$

$\ln (x-10) = \sqrt{2}$

Graph each function.

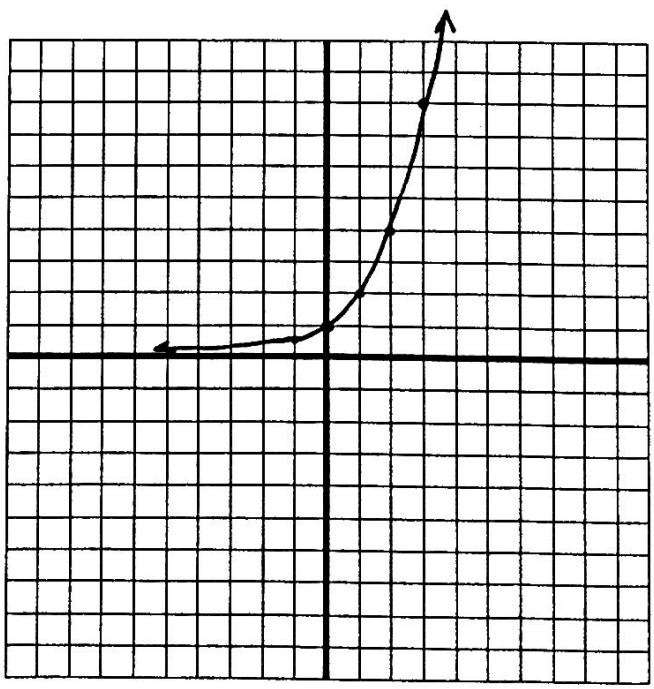
20. $f(x) = \left(\frac{1}{3}\right)^x$

x	y
-2	9
-1	3
0	1



21. $f(x) = 2^x$

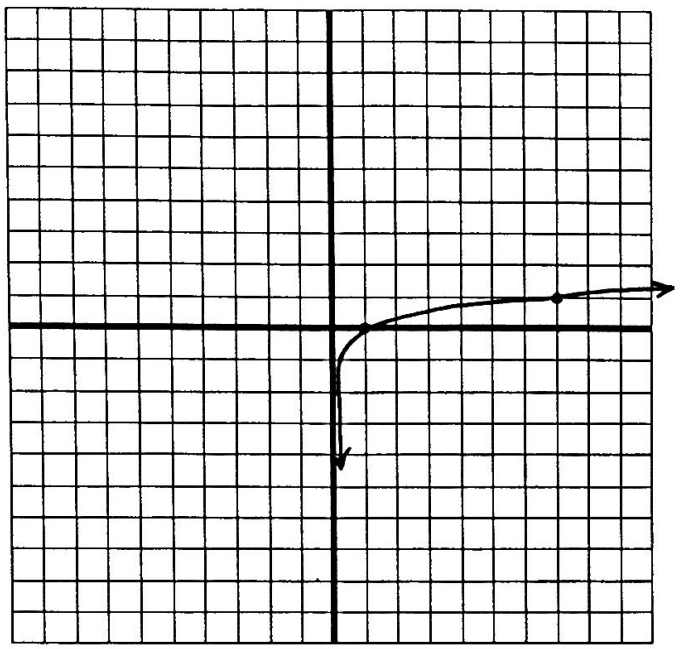
x	y
0	1
1	2
2	4



22. $f(x) = \log_7 x$

$7^y = x$

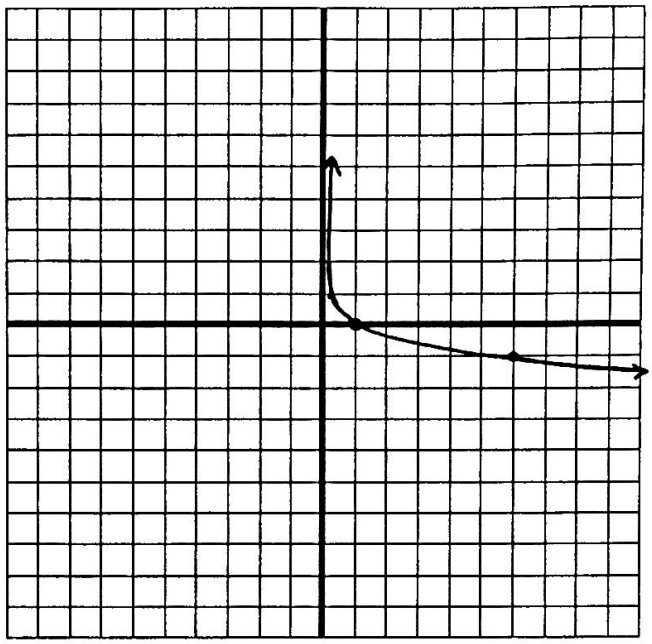
x	y
7	1
1	0



23. $f(x) \log_{1/6} x$

$\left(\frac{1}{6}\right)^y = x$

x	y
6	-1
1	0



Expand the logarithmic expressions.

24. $\log\left(x^3 y\sqrt{z}\right)$

$3\log x + \log y + \frac{1}{2}\log z$

25. $\ln\left(\frac{\sqrt{xy^3}}{ez^2}\right)$

$\ln\sqrt{xy^3} - \ln ez^2$

$\frac{1}{2}\ln x + \frac{3}{2}\ln y - [1 + 2\ln z]$

26. $\log_2\left(\frac{8x}{\sqrt[3]{y^2}}\right)$

$\log_2 8x - \log_2 \sqrt[3]{y^2}$

$\log_2 8 + \log_2 x - \frac{2}{3}\log_2 y$

$3 + \log_2 x - \frac{2}{3}\log_2 y$

Write each logarithmic expression as a single logarithm with a coefficient of 1.

27. $5\log x - 2\log(x+5)$

$\log\left[\frac{x^5}{(x+5)^2}\right]$

28. $\ln x - (\ln y - \ln z)$

$\ln\left[\frac{x}{\frac{y}{z}}\right] = \ln\left[x \cdot \frac{z}{y}\right]$

$\ln\left[\frac{xz}{y}\right]$

29. $\frac{1}{2}\log_2(xy) + 3\log_2 z - \log_2 a$

$\log_2\left[\frac{z^3\sqrt{xy}}{a}\right]$

Use the change-of-base formula and a calculator to approximate each logarithm accurate to six significant digits.

30. $\log_5 8$

1.292030

31. $\log_9 121$

2.182658

32. $\log_6 5.91$

0.991565

33. $\log_8 \pi$

0.550499

Solve the equation for x.

34. $7^x = 54$

$x \log 7 = \log 54$

$x = \dfrac{\log 54}{\log 7}$

$\boxed{x = 2.05}$

35. $\log 75x + \log(x+1) = 2$

$\log 75x(x+1) = 2$

$\log 75x^2 + 75x = 2$

$10^2 = 75x^2 + 75x$

$100 = 75x^2 + 75x$

$0 = 75x^2 + 75x - 100$

$0 = 25(3x^2 + 3x - 4)$

$x = \dfrac{-3 \pm 7.55}{6} = .76, -1.76$

36. $\ln x + \ln(x+5) = \ln 403.428$

$\ln x(x+5) = \ln 403.428$

$x^2 + 5x = 403.428$

$x^2 + 5x - 403.428 = 0$

$x = \dfrac{-5 \pm \sqrt{25 - 4(1)(-403.428)}}{2}$

$x = \dfrac{-5 \pm 40.48}{2}$

$x = 17.74, -22.74$

37. $4^{3x+11} = 89$

$\log 4^{3x+11} = \log 89$

$3x + 11 \log 4 = \log 89$

$3x + 11 = \dfrac{\log 89}{\log 4}$

$3x + 11 = 3.24$

$3x = -7.76$

$\boxed{x = -2.56}$

38. Use $pH = -\log[H^+]$ to find the hydronium-ion concentration of lemon juice that has a pH of 2.3.

$2.3 = -\log[H^+]$

$-2.3 = \log[H^+]$

$10^{-2.3} = H^+$

$\boxed{H^+ = 0.005012 \text{ mole per liter}}$

39. Find the balance when \$3750 is invested at an annual interest rate of 2.5% for 5 years is compounded

a. Monthly

b. Daily (365

c. Continuously

a. $A = P\left(1 + \frac{r}{n}\right)^{nt}$

$A = 3750\left(1 + \dfrac{.025}{12}\right)^{12(5)}$

$\boxed{A = \$4,248.75}$

c. $A = Pe^{rt}$

$A = 3750e^{(.025)(5)}$

$\boxed{A = \$4,249.31}$

b. \$4,249.29

40. Use the exponential growth function $N(t) = N_0 e^{kt}$ to answer the both **a** and **b**.

a. Find the exponential growth function for a city whose population was 25,500 in 2007 and 26,800 in 2008. Use $t = 0$ to represent 2007.

b. Use the growth function to predict, to the nearest hundred, the population of the city in 2014.

a. $N(t) = N_0 e^{kt}$

$26,800 = 25,500e^k$

$1.051 = e^k$

$\ln 1.051 = k \ln e$

$0.0497 = k$

$\boxed{N(t) = 25,500e^{0.0497t}}$

b. 36,100