Chapter 4 Review

KEY

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

1. $F(x)=2x-5$ $\quad G(x)=\dfrac{x+5}{2}$

yes

2. $p(x)=\dfrac{x-5}{2x}$ $\quad q(x)=\dfrac{2x}{x-5}$

No

Find the inverse of each function, then state the domain and range of $f^{-1}(x)$.

3. $f(x)=3x-4$

$y+4=3x$

$f^{-1}(x)=\frac{1}{3}x+\frac{4}{3}$

D_x of $f^{-1}(x)$: $(-\infty,\infty)$

R_y of $f^{-1}(x)$: $(-\infty,\infty)$

4. $f(x)=\sqrt{x-12}$

$x-12\geq 0$

$x\geq 12$

$y=\sqrt{x-12}$

$y^2=x-12$

$y^2+12=x$

$f^{-1}(x)=x^2+12$

D_x of $f^{-1}(x)$: $[0,\infty)$

R_y of $f^{-1}(x)$: $\{y \mid y\geq 12\}$

Solve each equation.

5. $\log_5 25=x$

$x=2$

6. $\ln e^3=x$

$x=3$

7. $3^{2x+7}=27$

$2x+7=\dfrac{\log 27}{\log 3}$

$2x+7=3$

$2x=-4$

$x=-2$

8. $3^x=\dfrac{1}{243}$

$x\log 3=\log\frac{1}{243}$

$x=\dfrac{\log(1/243)}{\log 3}$

$x=-5$

10. $\log x^2=2$

$10^2=x^2$

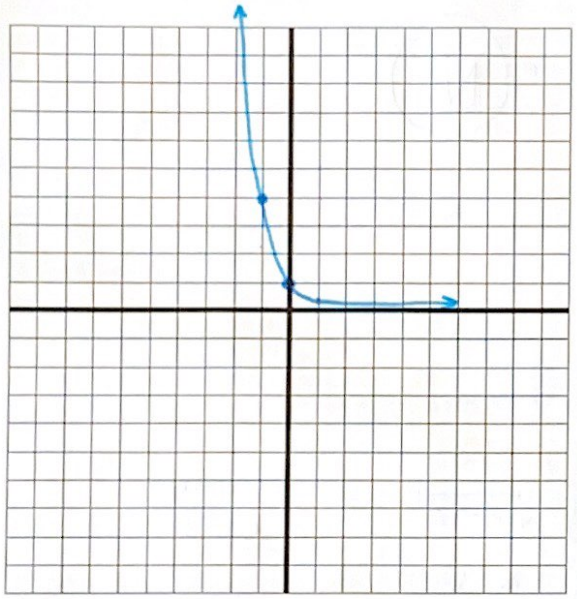
$100=x^2$

$x=\pm 10$

Graph each function.

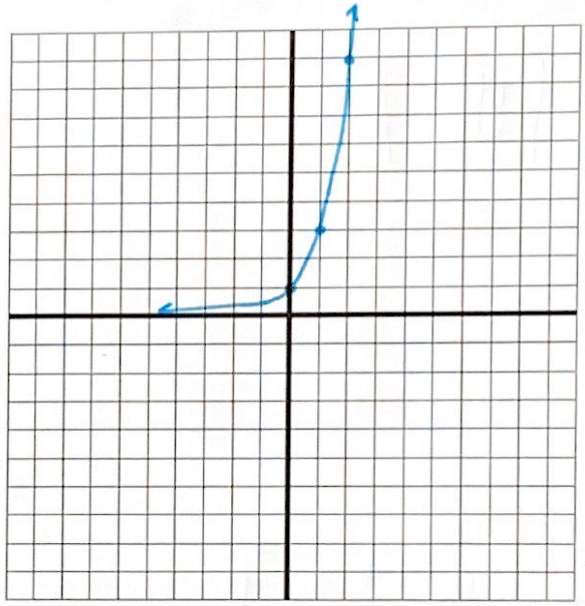
11. $f(x)=\left(\frac{1}{4}\right)^x$

x	y
-1	4
0	1



12. $f(x)=3^x$

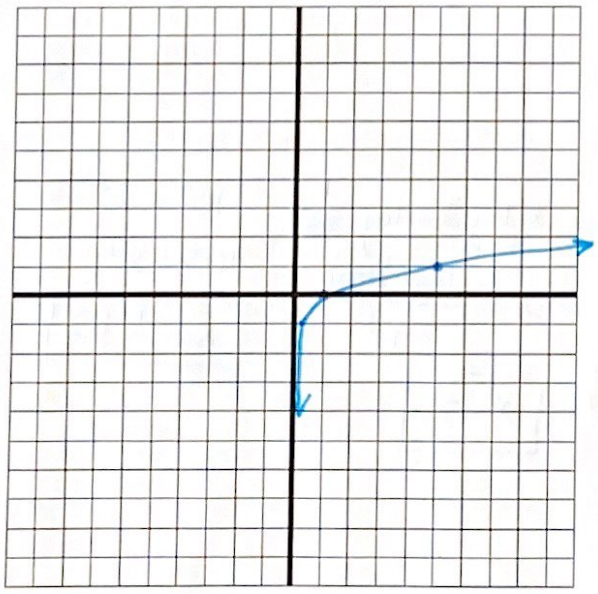
x	y
0	1
1	3
2	9



13. $f(x)=\log_5 x$

$5^y=x$

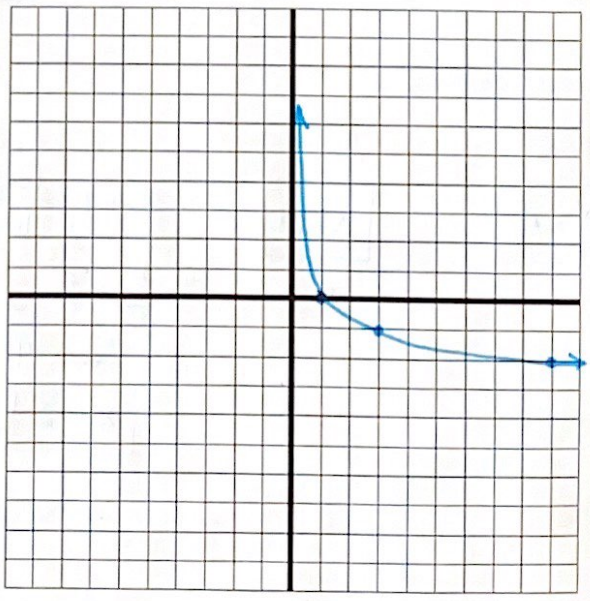
x	y
5	1
1	0



14. $f(x)\log_{1/3} x$

$\left(\frac{1}{3}\right)^y=x$

x	y
9	-2
3	-1
1	0



Write each equation in its exponential form.

15. $5 = \log_2 32$

$2^5 = 32$

16. $-2 = \log \frac{1}{100}$

$10^{-2} = \frac{1}{100}$

17. $\ln x = 4$

$e^4 = x$

18. $\log_5 (4 - x) = 3$

$5^3 = 4 - x$

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

19. $2^{10} = 1024$

$\log_2 1024 = 10$

20. $8^{1/2} = 2\sqrt{2}$

$\log_8 2\sqrt{2} = \frac{1}{2}$

21. $167.34 = e^{5.12}$

$\ln 167.34 = 5.12$

22. $e^{\pi} = (x + 4)$

$\ln (x+4) = \pi$

Expand the logarithmic expressions.

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

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

24. $\ln xy^3$

$\ln x + 3 \ln y$

25. $\log_5\left(\frac{25\sqrt{x}}{y^2}\right)$

$2 + \frac{1}{2}\log_5 x - 2\log_5 y$

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

26. $2\log x + \frac{1}{3}\log(x+1)$

$\log\left(x^2\sqrt[3]{x+1}\right)$

27. $\frac{1}{2}\ln 2xy - 3\ln z$

$\ln\left[\frac{\sqrt{2xy}}{z^3}\right]$

28. $2\log x - \left[\frac{1}{2}\log y + \frac{3}{2}\log z\right]$

$\log\left[\frac{x^2}{\sqrt{yz^3}}\right]$

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

29. $\log_2 551$

9.10591

30. $\log_{12} 43$

1.51362

31. $\log_4 0.85$

-0.117233

32. $\log_8 0.3$

-0.578989

Solve the equation for x.

33. $4^x = 30$

$x = \frac{\ln(30)}{\ln(4)}$

$x = 2.45$

34. $\ln 3x + \ln 2 = 1$

$\ln(6x) = 1$

$6x = e^1$

$x = \frac{e}{6}$

$x = 0.453$

35. $\ln 3x - \ln(x-1) = \ln 4$

$\ln\left(\frac{3x}{x-1}\right) = \ln 4$

$(x-1)\frac{3x}{x-1} = 4(x-1)$

$3x = 4x - 4$

$-x = -4$

$x = 4$

36. $5^{x+1} = 41$

$(x+1)\log 5 = \log 41$

$x+1 = \frac{\log 41}{\log 5}$

$x = \frac{\log 41}{\log 5} - 1$

$x = 1.307$

37. Determine, to the nearest 0.1, the Richter scale magnitude of an earthquake with an intensity of $I = 63,280,000 I_0$.

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

$M = \log\left(\frac{63,280,000\, I_0}{I_0}\right)$

$M = \log(63,280,000)$

$M = 7.8$

38. An earthquake ad a Richter scale magnitude of 7.2. Its aftershock had a Richter scale magnitude of 3.7. Compare the intensity of the earthquake with the intensity of the aftershock by finding, to the nearest unit, the ratio of the larger intensity to the smaller intensity.

$7.2 = \log\left[\frac{I_1}{I_0}\right]$

$10^{7.2} = \frac{I_1}{I_0}$

$10^{7.2} I_0 = I_1$

$10^{3.7} I_0 = I_2$

$\frac{I_1}{I_2} = \frac{10^{7.2} I_0}{10^{3.7} I_0} = \frac{10^{3.5}}{1} = \frac{3162}{1}$

39. Find the balance when \$48,000 is invested at an annual interest rate of 3.75% for 25 years if the interest is compounded

a. Semiannually (2)

b. Monthly (12)

c. Daily (365)

a) $A = 48,000\left(1 + \frac{.0375}{2}\right)^{2(25)}$

$A = \$121,512.88$

b) $A = \$122,393.25$

c) $A = \$122.566.39$