

Pp. 407-408

- 14) 1.256 20) -0.61173 28) -1/8
 36) 3 38) 11 48) 3

Nov 19-5:41 PM

Find the inverse. State Domain & Range for $f(x)$ and $f^{-1}(x)$

1. $f(x) = \sqrt{3x+2}$ $D: \{x | x \geq -\frac{2}{3}\}$ $R: \{y | y \geq 0\}$
 $x = \sqrt{3y+2}$
 $x^2 = 3y+2$
 $y = \frac{x^2-2}{3}$
 $f^{-1}(x) = \frac{x^2-2}{3}$ $D: \{x | x \geq 0\}$ $R: \{y | y \geq -\frac{2}{3}\}$

2. $f(x) = \frac{x-3}{2x+2}$ $D: \{x | x \neq -1\}$ $R: \{y | y \neq \frac{1}{2}\}$
 $x = \frac{y-3}{2y+2}$
 $2xy+2x = y-3$
 $2x+3 = y-2xy$
 $2x+3 = y(1-2x)$
 $y = \frac{2x+3}{1-2x}$
 $f^{-1}(x) = \frac{2x+3}{1-2x}$ $D: \{x | x \neq \frac{1}{2}\}$ $R: \{y | y \neq -1\}$

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Solve without the use of a calculator. You must show ALL work!

3. $x = \log_2 64$ 4. $x = \log_5(1/25)$
 $2^x = 64$ $5^x = \frac{1}{25}$
 $2^x = 2^6$ $5^x = 5^{-2}$
 $\therefore x = 6$ $\therefore x = -2$
 $\{6\}$ $\{-2\}$

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Use a calculator to find x to four decimal places.

5. $x = \log_3 5$ $x = 1.4650$ 6. $x = \log_2 23$ $x = 4.5236$
 7. $x = e^{4.254}$ $x = 105.0042$ 8. $\log x = 3.8796$ $x = 7578.7922$

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Expand

9. $\ln \sqrt{x^2 y} = \frac{1}{2}(\ln x^2 y)$
 $= \frac{2}{2} \ln x + \frac{1}{2} \ln y$
 $= \ln x + \frac{1}{2} \ln y$

10. $\log \frac{\sqrt[3]{x} y^2}{ab}$
 $= \frac{1}{3} \log x + 2 \log y - \log a - \log b$

11. $\log \left(\frac{2x}{z^2} \right)$
 $= \log 2 + \log x - 2 \log z$

12. $\ln \frac{x^4 y^2}{\sqrt{z}}$
 $= 4 \ln x + 2 \ln y - \frac{1}{2} \ln z$

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Write as a single log. Simplify if possible.

13. $3 \ln x - 4 \ln y - \frac{1}{2} \ln z$
 $= \ln \frac{x^3}{y^4 \sqrt{z}}$

14. $3 \log x - 4 \log y + \frac{1}{2} \log z$
 $= \log \frac{x^3 \sqrt{z}}{y^4}$

15. $\log(x^2 - 9) - (\log(x+3) + \log(x-1))$
 $= \log \frac{(x^2-9)}{(x+3)(x-1)}$
 $= \log \frac{(x-3)(x+3)}{(x+3)(x-1)}$
 $= \log \left(\frac{x-3}{x-1} \right)$

16. $2 \ln x + 4 \ln x$
 $= \ln x^2 + \ln x^4$
 $= \ln x^6$

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Solve for x . Where an exact answer is not possible, round to the nearest hundredth.

17. $25^{2x+1} = 125^{3x+4}$
 $5^{2(2x+1)} = 5^{3(3x+4)}$
 $\therefore 4x-2 = 9x+12 \quad \{-14\}$
 $x = -\frac{14}{5}$
 $\{-5\}$

18. $e^{4x} = 53$
 $4x \ln e = \ln 53$
 $x = \frac{\ln 53}{4}$
 $x = .99$
 $\{.99\}$

19. $8^{x-3} = \left(\frac{1}{16}\right)^{1-x}$
 $2^{3(x-3)} = 2^{-4(1-x)}$
 $\therefore 3x-9 = -4+4x$
 $-5 = x$
 $\{-5\}$

20. $\ln(2x-3) = \ln 11$
 $2x-3 = 11$
 $2x = 14$
 $x = 7$
 $\{7\}$

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21. $\log_2 x + \log_2 3 = 3$
 $\log_2 3x = 3$
 $2^3 = 3x$
 $8 = 3x$
 $x = \frac{8}{3}$
 $\{\frac{8}{3}\}$

22. $2\log_3 x = 6$
 $\log_3 x^2 = 6$
 $3^6 = x^2$
 $x = \pm 27$
 $\{27\}$

23. $\log x - \log 3 = 2\log 4$
 $\log \frac{x}{3} = \log 16$
 $\therefore \frac{x}{3} = 16$
 $x = 48$
 $\{48\}$

24. $4e^{x+1} = 16$
 $e^{x+1} = 4$
 $(x+1) \ln e = \ln 4$
 $x = \ln(4) - 1$
 $x = .39$
 $\{.39\}$

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25. Suppose that \$10,000 is invested at an annual interest rate of 5.4% compounded quarterly. How much money will be in the account at the end of $6\frac{1}{2}$ years?

$$A = 10000 \left(1 + \frac{.054}{4}\right)^{4(6.5)}$$

$$A = \$14,171.56$$

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26. How old is a bone if it currently contains 20.45 grams of carbon-14 but was estimated to originally have 80 grams of carbon-14, whose half-life is 5730 years? ($A = A_0 \left(\frac{1}{2}\right)^{\frac{t}{T}}$) Round to the nearest hundred years.

$$20.45 = 80 \left(\frac{1}{2}\right)^{\frac{t}{5730}}$$

$$\frac{409}{1600} = \left(\frac{1}{2}\right)^{\frac{t}{5730}}$$

$$\log \left(\frac{409}{1600}\right) = \frac{t}{5730} \log \left(\frac{1}{2}\right)$$

$$t = \frac{5730 \log \left(\frac{409}{1600}\right)}{\log \left(\frac{1}{2}\right)}$$

$$t = 11,300 \text{ years}$$

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