$D_f = (-2, \infty)$ $f^{-1}(x) = 3^x - 2$ $R_{f^{-1}} = D_f = (-2, \infty)$.

Answer to Problem 9.

(a) $\log_3(2x)$ (b) $\log_2\left(\frac{9}{y}\right)$ (c) $\log\left(\frac{x^2}{y^5}\right)$ (d) $\log_4\sqrt{x+5}$

(e) $\log_6\left(\frac{1}{16x^4}\right)$ (f) $\ln\left(\frac{x^3y^4}{z^4}\right)$ (g) $\log_2\sqrt[3]{x^2+x}$

Answer to Problem 10.

(a) $\log_3 y - \log_3 2$ (b) $1 + \log x$ (c) $-3\log_6 z$

(d) $1 + 2\log_4 x + \log_4 y$ (e) $2 + 2\log_4 x + 2\log_4 y$ (f) $\log(x^2-1) - 3\log x$

(g) $\frac{2}{5}\ln x - \frac{3}{5}\ln y$ (h) $\frac{1}{2}\log_2 x - 4\log_2 z$

Answer to Problem 11.

(a) 2 (b) $\frac{1}{2}$

Answer to Problem 12.

(a) $\log_a\left(\frac{1}{n}\right) = \log_a 1 - \log_a n = 0 - \log_a n = -\log_a n$

(b) $\log_a\left(\frac{1}{n}\right) = \log_a n^{-1} = -1\log_a n = -\log_a n$

Answer to Problem 13.

Proof not shown.

Answer to Problem 14.

Answers will vary.

Answer to Problem 15.

(a) $\frac{\log_5 9}{\log_5 7}$ (b) $\frac{\log_{10} 9}{\log_{10} 7}$ (c) $\frac{\ln 9}{\ln 7}$

Answer to Problem 16.

$$\log_a b = \frac{\log_b b}{\log_b a} = \frac{1}{\log_b a}$$

Answer to Problem 17.

$$\log_2 5 = \frac{\log_4 5}{\log_4 2} = \frac{\log_4 5}{\frac{1}{2}} = 2\log_4 5$$

Answer to Problem 18.

(a) $e^{x\ln 3}$ (b) $e^{x\ln 6}$ (c) $e^{x\ln 10}$

Answer to Problem 19.

(a) 2.71 (b) 0.41 (c) 0.23 (d) -0.1

Answer to Problem 20.

(a) 1.477 (b) 3.477 (c) $\dfrac{1}{0.477}$

Answer to Problem 21.

(a) $\dfrac{\log 21}{\log 9}$ (b) $\dfrac{\ln 21}{\ln 9}$ (c) Proof not shown. Hint: Rewrite using base 3.

Answer to Problem 22.

(a) 8 (b) $\log_5 16$ (c) $\log_6 37$ (d) $\dfrac{1}{2}$

(e) $\log_3 6$ (f) $\dfrac{-\ln 3}{\ln 4 - 2\ln 3}$ (g) $\dfrac{\log 2}{\log 2 - \log 5}$

Answer to Problem 23.

(a) $\dfrac{25}{3}$ (b) $1,000,000$ (c) e^{e^2} (d) $\dfrac{1}{8}$ (e) 54 (f) 2 (g) 1