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14.4 Logarithms

1) a) $10^3 = 1000$

$\log_{10} 1000 = 3$

b) $\log_2 8 = 3$

$2^3 = 8$

c) $7^2 = 49$

$\log_7 49 = 2$

d) $6^{-3} = \frac{1}{216}$

$\log_6 \frac{1}{216} = -3$

e) $\log_4 \frac{1}{256} = -4$

$4^{-4} = \frac{1}{256}$

f) $\log_9 9 = 1$

$9^1 = 9$

g) $25^{\frac{1}{2}} = 5$

$\log_{25} 5 = \frac{1}{2}$

h) $\log_{27} 3 = \frac{1}{3}$

$27^{\frac{1}{3}} = 3$

2) a) $\log_8 64$

$\log_8 64 = x$

$8^x = 64$

$x = 2$

b) $\log_2 \frac{1}{16}$

$\log_2 \frac{1}{16} = x$

$2^x = \frac{1}{16}$

$x = -4$

c) $\log_5 5$

$\log_5 5 = x$

$5^x = 5$

$x = 1$

d) $\log_3 \sqrt[3]{3}$

$\log_3 \sqrt[3]{3} = x$

$3^x = \sqrt[3]{3}$

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

e) $\log_{10} 0.01$

$\log_{10} 0.01 = x$

$10^x = 0.01$

$x = -2$

f) $\log_9 1$

$\log_9 1 = x$

$9^x = 1$

$x = 0$

3) a) $\log_3 x = 4$

$3^4 = x$

$x = 81$

b) $\log_5 (3x-1) = 3$

$5^3 = 3x - 1$

$3x - 1 = 125$

$3x = 126$

$x = 42$

c) $\log_x 729 = 3$

$x^3 = 729$

$x = \sqrt[3]{729} = 9$

$x = 9$

d) $\log_x (4x) = 2$

$x \cancel{x}^2 = 4 \cancel{x}$

$x = 4$

4) a) $\log_5 18 = 1.79588$

↳ 1.7959

b) $\log e\, 0.6 = -0.51082$

↳ -0.5108

c) $2 \log_8 9 = 2.113283$

↳ 2.1133

5) $\log_8 (2x-1) = \frac{5}{3}$

$8^{5/3} = 2x - 1$

$2x - 1 = 32$

$2x = 33$

$x = \frac{33}{2}$

6) $\log_x 64 = 3/4$

$x^{3/4} = 64$

$64^4 = 16777216$

$\sqrt[3]{16777216} = 256$

$x = 256$

7) $\log_{125} x = -\frac{4}{3}$

$125^{-4/3} = x$

$x = \left(\frac{1}{125}\right)^{\frac{4}{3}}$

$x = \frac{1}{625}$

8) $\log_a (\sqrt[3]{a^2})$

$\sqrt[3]{a^2} = (a^2)^{\frac{1}{3}}$

$\log_a (a^{2/3})$

$a = \frac{2}{3}$