

Exponential and Logarithmic Functions

Rewrite each equation in logarithmic form.

1) $9^y = x$

$$\log_9 x = y$$

2) $8^{19} = v$

$$\log_8 v = 19$$

3) $v^{-1} = u$

$$\log_v u = -1$$

4) $19^2 = 361$

$$\log_{19} 361 = 2$$

Rewrite each equation in exponential form.

5) $\log n = m$

$$10^m = n$$

6) $\log_v 114 = 6$

$$v^6 = 114$$

7) $\log_{15} 225 = 2$

$$15^2 = 225$$

8) $\log_x z = y$

$$x^y = z$$

Find the inverse of each function.

9) $y = \log_x 3$

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

10) $y = \log x$

$$y = 10^x$$

11) $y = \log x^4$

$$y^{-1} = \sqrt[4]{10^x}$$

12) $y = \log_3 (x+6)$

$$3^x - 6 = y^{-1}$$

13) $y = \log_{\frac{1}{5}} (3 \cdot 3^x) + 10$
$$\log_3 \left(\frac{\left(\frac{1}{5}\right)^{x-10}}{3} \right) = y^{-1}$$

14) $y = 6 \log_3 (x-9) - 9$

$$y^{-1} = 3^{\frac{x+9}{6}} + 9$$

15) $y = -8 \log (4x^5 + 1) - 6$

$$\sqrt{\frac{10^{\frac{x+6}{-8}} - 1}{4}} = y^{-1}$$

16) $y = -7 \log (4x^3 + 4) + 6$

$$y^{-1} = 3 \sqrt{\frac{10^{\frac{x-6}{-7}} - 4}{-4}}$$

$$17) y = 6^x$$

$$\log_6 x = y^{-1}$$

$$19) y = \log_5 (2^x - 10)$$

$$\log_2 (5^x + 10) = y^{-1}$$

$$21) y = \log_4 \frac{e^x + 2}{-3}$$

$$\ln(-3 \cdot 4^x - 2) = y^{-1}$$

$$18) y = 4^x$$

$$\log_4 x = y^{-1}$$

$$20) y = (3^x - 9)^{\frac{1}{4}}$$

$$\log_3 (\sqrt[4]{x} + 9) = y^{-1}$$

$$22) y = \left(\frac{3^x - 7}{3}\right)^{\frac{1}{2}}$$

$$\log_3 (3x^2 + 7) = y^{-1}$$

Condense each expression to a single logarithm.

$$23) 3 \log_2 z + \frac{\log_2 x}{3} + \frac{\log_2 y}{3}$$

$$\log_2 z^3 \sqrt[3]{xy}$$

$$25) \log_5 c + \log_5 d + \frac{\log_5 a}{3} + \frac{\log_5 b}{3}$$

$$\log_5 cd \sqrt[3]{ab}$$

$$24) 12 \log_8 z + 12 \log_8 x - 3 \log_8 y$$

$$\log_8 \left(\frac{(zx)^{12}}{y^3} \right) = \log_8 \left(\frac{(zx)^4}{y} \right)$$

$$26) 12 \ln w + 12 \ln u - 4 \ln v$$

$$\ln \left(\frac{(uw)^{12}}{v^4} \right) = \ln \left(\frac{(uw)^3}{v} \right)^4$$

Expand each logarithm.

$$27) \log_4 (bc^2 \sqrt{a})$$

$$\log_4 b + 2 \log_4 c + \frac{\log_4 a}{2}$$

$$29) \log_7 \left(\frac{u}{wv^4} \right)^4$$

$$4 \log_7 u - [4 \log_7 w + 16 \log_7 v]$$

$$28) \log_4 \left(\frac{x \cdot z}{y^4} \right)^5 = 5 \log_4 x + 5 \log_4 z - 20 \log_4 y$$

$$30) \log_8 (c^4 \sqrt{a \cdot b})$$

$$4 \log_8 c + \frac{\log_8 a}{2} + \frac{\log_8 b}{2}$$