

Expand.

$$\log_4 5x^2y^3 = \log_4 5 + \log_4 x^2 + \log_4 y^3$$
$$= \underline{\underline{\log_4 5 + 2\log_4 x + 3}}$$

Warm Up

$$\ln\left(\frac{\sqrt{x}}{yz}\right) = \ln \sqrt{x} - \ln yz$$
$$= \underline{\underline{\ln x^{\frac{1}{2}} - (\ln y + \ln z)}}$$

Condense.

$$\log_3 7 + 2\log_3 y - \log_3 x =$$
$$= \underline{\underline{\log_3 \frac{7y^2}{x}}}$$

$$\frac{1}{2}\log(x+3) - \log 5 - \log x =$$
$$= \underline{\underline{\log(x+3)^{\frac{1}{2}} - \log 5 - \log x}}$$

$$\log \sqrt{x+3} - \log 5 - \log x$$
$$= \boxed{\underline{\underline{\log \frac{\sqrt{x+3}}{5x}}}}$$

$$\frac{3}{2} \log_4 5^6 - \frac{3}{4} \log_4 +^4$$

$$= \log_4 (5^6)^{\frac{3}{2}} - \log_4 (+^4)^{\frac{3}{4}}$$

$$\log_4 \frac{5^6 - \log_4 +}{\log_4 \frac{(5^6)^{\frac{3}{2}}}{(+^4)^{\frac{3}{4}}}}$$

$$\boxed{\log_4 5^6}$$

$$5^1 5^{1/2}$$

$$5\sqrt{5}$$

$$\ln X = 2(\ln(x+z) + \ln(x-z))$$

$$\ln X = (\ln(x+z) + \ln(x-z))^2$$

$$\ln X = \ln (x^2 - 4)^2$$

$$\ln \left(\frac{x}{x^2 - 4} \right)^2$$

Solving Exponential Equations using the One-to-One Property (No Calc)

Hint: Rewrite non-exponential side using the same base

Example 1: $16 = 4^{x+1}$

$$4^2 = 4^{x+1}$$

$$\therefore 2 = x + 1$$

$$(x=1)$$

Example 2: $(\frac{1}{2})^x = 8$

~~$(2^{-1})^x = 8$~~

$$2^{-x} = 2^3$$

$$\begin{aligned} -x &= 3 \\ x &= -3 \end{aligned}$$

Example 3: $3^{x+1} = 27$

$$3^{x+1} = 3^3$$

$$\begin{aligned} x+1 &= 3 \\ x &= 2 \end{aligned}$$

Example 4: $2^{x-2} = \frac{1}{32}$

$$2^{x-2} = 2^{-5}$$

$$\begin{aligned} x-2 &= -5 \\ x &= -3 \end{aligned}$$

Solving Logarithmic & Exponential Equations

Calc

Ex5.

$$3^x = 30$$

$$\log_3 30 = x$$

$$\frac{\log_{10} 30}{\log_{10} 3} = 3.1$$

Ex6.

$$(\frac{1}{4})^x = 60$$

$$\log_{\frac{1}{4}} 60 = x$$

$$-2.95$$

Ex.7

$$3(2^x) = 42$$

$$\overline{3} \quad \overline{3}$$

$$2^x = 14$$

$$\log_2 14 = x$$

$$\textcircled{x = 3.81}$$

Ex.8

$$e^x = 7$$

$$\log_e 7 = x$$

$$\ln 7 = x$$

$$x = 1.95$$

~~$$e^x = \ln 7$$~~

$$x = \ln 7$$

$$x = 1.95$$

Ex.9

$$5 - 3e^x = 2$$
$$\begin{array}{r} -5 \\ -5 \end{array}$$
$$\frac{-3e^x}{-3} = \frac{-3}{-3}$$
$$e^x = 1$$
$$x = 0$$

Ex.10

$$2(3^{2+5}) - 4 = 11$$
$$2(3^{2+5}) = 15$$
$$3^{2+5} = 7.5$$
$$\log_3 7.5 = 2 + 5$$
$$1.83 = 2 + 5$$
$$3.42$$

Ex.11

$$e^{2x} - 7e^x = -12$$

$$e^{2x} - 7e^x + 12 = 0$$

$$(e^x - 4)(e^x - 3) = 0$$

$$e^x - 4 = 0$$

$$e^x = 4$$

$$\log_e 4 = x$$

$$\ln 4 = x$$

$$x = 1.39$$

Ex.12

$$e^{2x} - 4e^x - 5 = 0$$

$$(e^x - 5)(e^x + 1) = 0$$

$$e^x = 5 \quad e^x = -1$$

$$\log_e 5 = x$$

$$\ln 5 = x$$

$$x = 1.61$$

~~$$\log_e x = x$$~~

Section 8.6

Solving Logarithmic & Exponential Equations

Example 1:

Solve $\log_3 x = \log_3 12$

Example 2:

Solve $\log(2x - 1) = \log x$

Example 3: Solve $\log_4(x^2 - 6) = \log_4 10$

$$\text{Ex.1} \quad \ln x = -3$$

$$\text{Ex.2} \quad \log x = -1$$

$$\text{Ex.3} \quad 2\log_5(3x) = 4$$

$$\text{Ex.4} \quad \ln x - \ln 3 = 0$$

$$\text{Ex.5 } \log_3(2x + 1) + \log_3(2) = \log_3(5x)$$

$$\text{Ex.6 } \log_6(3x + 14) - \log_6(5) = \log_6(2x)$$

$$\text{Ex.7} \quad \log(5x) + \log(x - 1) = 2$$

$$\text{Ex.8} \quad \log_4 x - \log_4(x - 1) = \frac{1}{2}$$

Ex.9

$$\log x + \log(x + 4) = 1$$

