

p. 421

$$\# 14. \ln\left(\frac{e^4}{8}\right) = \ln e^4 - \ln 8 = 4 \ln e - \ln 8 \\ = \underline{4 - \ln 8} \text{ (or) } \underline{4 - 3 \ln 2}$$

$$\# 21. \log_b(x^2 y) = \log_b x^2 + \log_b y = \underline{2 \log_b x + \log_b y}$$

$$\# 24. \log_5\left(\frac{\sqrt{x}}{25}\right) = \log_5 \sqrt{x} - \log_5 25 = \underline{\frac{1}{2} \log_5 x - \log_5 25} \\ \text{(or) } \underline{\frac{1}{2} \log_5 x - 2 \log_5 5}$$

$$\# 27. \log_b\left(\frac{x^2 y}{z^2}\right) = \log_b(x^2 y) - \log_b z^2 \\ = \log_b x^2 + \log_b y - \log_b z^2 \\ = \underline{2 \log_b x + \log_b y - 2 \log_b z}$$

$$\# 32. \log \sqrt[5]{\frac{x}{y}} = \log \frac{x^{1/5}}{y^{1/5}} = \log x^{1/5} - \log y^{1/5} \\ = \underline{\frac{1}{5} \log x - \frac{1}{5} \log y}$$

$$\# 49. \log x + 3 \log y = \log x + \log y^3 = \underline{\log(xy^3)}$$

$$\# 51. \frac{1}{2} \ln x + \ln y = \ln x^{1/2} + \ln y = \underline{\ln(x^{1/2} y)} \text{ (or) } \underline{\ln(y \sqrt{x})}$$

$$\# 58. 2 \ln x - \frac{1}{2} \ln y = \ln x^2 - \ln y^{1/2} = \underline{\ln\left(\frac{x^2}{y^{1/2}}\right)} \text{ (or) } \underline{\ln\left(\frac{x^2}{\sqrt{y}}\right)}$$

$$\begin{aligned}
 \#66. & \frac{1}{3} (\log_4 x - \log_4 y) + 2 \log_4 (x+1) \\
 &= \frac{1}{3} \log_4 x - \frac{1}{3} \log_4 y + 2 \log_4 (x+1) \\
 &= \log_4 x^{1/3} - \log_4 y^{1/3} + 2 \log_4 (x+1) \\
 &= \log_4 \left( \frac{x^{1/3}}{y^{1/3}} \right) + \log_4 (x+1)^2 \\
 &= \log_4 \left( \frac{x^{1/3} (x+1)^2}{y^{1/3}} \right)
 \end{aligned}$$

#65. Condense logs on left side

$$\log_5 x + \log_5 (4x-1) = 1$$

$$\log_5 (4x^2 - x) = 1$$

$$5^1 = 4x^2 - x$$

$$0 = 4x^2 - x - 5$$

$$0 = (4x-5)(x+1)$$

$$\boxed{x = 5/4} \text{ or } \cancel{x = -1}$$

here, use the fact that  $\log_b a = L$  is the same as  $b^L = a$

won't work in the original equation

#67. Condense

$$\log_3 (x-5) + \log_3 (x+3) = 2$$

$$\log_3 [(x-5)(x+3)] = 2$$

$$\log_3 (x^2 - 2x - 15) = 2$$

$$3^2 = x^2 - 2x - 15$$

$$\begin{aligned}
 0 &= x^2 - 2x - 24 \\
 0 &= (x+4)(x-6) \\
 \cancel{x = -4} &\text{ or } \boxed{x = 6}
 \end{aligned}$$

