

## HW 24 Solutions

5.4.4

$$\begin{aligned}\log_3(27w) &= \log_3(27) + \log_3(w) \\ &= \boxed{3 + \log_3(w)}\end{aligned}$$

5.4.5

$$\begin{aligned}\ln(5e^2) &= \ln(5) + \ln(e^2) \\ &= \boxed{\ln(5) + 2}\end{aligned}$$

5.4.7

$$\begin{aligned}\log 100p &= \log(100) + \log(p) \\ &= \boxed{2 + \log(p)}\end{aligned}$$

5.4.9

$$\begin{aligned}\log_{\sqrt{2}}(8x) &= \log_{\sqrt{2}}(8) + \log_{\sqrt{2}}(x) \\ &= \boxed{6 + \log_{\sqrt{2}}(x)}\end{aligned}$$

$$\sqrt{2}^x = 8$$

$$(2)^{x/2} = 8$$

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

$$\boxed{x = 6}$$

5.4.13

$$\begin{aligned}\frac{\log \sqrt{x}}{\log \log_3} &= \log \sqrt{x} - \log 10y^3 \\ &= \log \sqrt{x} - (\log 10 + \log y^3) \\ &= \log \sqrt{x} - \log 10 - 3 \log y \\ &= \boxed{\log \sqrt{x} - 1 - 3 \log y} \\ &= \boxed{\frac{1}{2} \log x - 3 \log y - 1}\end{aligned}$$

Better.

5.4.27

$$\begin{aligned}\log(x+2) + \log(x-2) &= \log((x+2)(x-2)) \Leftrightarrow \\ &= \log(x^2-4)\end{aligned}$$

5.4.34

$$\ln 5 + \ln x = \ln 7 + \ln(3x-2)$$

$$\ln(5x) = \ln(21x-14)$$

$$\begin{array}{r} 5x = 21x - 14 \\ +14 \quad -5x \quad -5x \quad +14 \end{array}$$

$$14 = 16x$$

$$\frac{14}{16} = x \Rightarrow \boxed{x = \frac{7}{8}}$$

5.4.37

$$8 = \log_4 51$$

$$4^2 = 16$$

$$4^3 = 64$$

← 51

guess 2.7

← anything  
between  
2.5 and 2.9  
is ok.

$$\log_4 51 = \frac{\log(51)}{\log(4)} \approx \frac{1.71}{0.6} = 2.85$$

5.4.46

$$\log_{1/3}(x) = \log_3(20)$$

$$\Rightarrow \frac{\log_3(x)}{\log_3(1/3)} = \log_3(20)$$

$$\frac{\log_3(x)}{-1} = \log_3(20)$$

$$\frac{\log_3(x^{-1})}{-1} = \log_3(20)$$

$$x^{-1} = 20 \text{ or } \boxed{x = \frac{1}{20}}$$