Review Exercise Set 9

Exercise 1: Use the properties of logarithms to simplify the following expression.

$$\log_8 \sqrt[3]{64}$$

Exercise 2: Use the properties of logarithms to simplify the following expression.

$$e^{-\frac{1}{3}\ln 8}$$

Exercise 3: Use the properties of logarithms to rewrite each expression as a sum and/or difference of logarithms.

a) $\log_b\left(a^2b^3\right)$

b) $\log_b \dfrac{7}{8xy^2}$

Exercise 4: Use the properties of logarithms to rewrite each expression as a single logarithm.

a) $3 \log_b (xy) - 5 \log_b z$

b) $\frac{1}{2} \log_b (x - 3) + 3 \log_b (y + 1) - \log_b (2z - 5)$

Exercise 5: Evaluate the following logarithm by using the change-of-base formula.

$\log_4 27$

Review Exercise Set 9 Answer Key

Exercise 1: Use the properties of logarithms to simplify the following expression.

$$\begin{aligned}\log_8 \sqrt[3]{64} &= \log_8 \sqrt[3]{8^2} \\ &= \log_8 8^{\frac{2}{3}} \\ &= \frac{2}{3}\end{aligned}$$

Exercise 2: Use the properties of logarithms to simplify the following expression.

$$\begin{aligned}e^{-\frac{1}{3}\ln 8} &= e^{\ln 8^{-\frac{1}{3}}} \\ &= 8^{-\frac{1}{3}} \\ &= \frac{1}{8^{\frac{1}{3}}} \\ &= \frac{1}{\sqrt[3]{8}} \\ &= \frac{1}{2}\end{aligned}$$

Exercise 3: Use the properties of logarithms to rewrite each expression as a sum and/or difference of logarithms.

a) $\log_b (a^2b^3)$

$\log_b (a^2b^3) = \log_b a^2 + \log_b b^3$
$= 2\log_b a + 3\log_b b$
$= 2\log_b a + 3(1)$
$= 2\log_b a + 3$

b) $\log_b \frac{7}{8xy^2}$

$\log_b \frac{7}{8xy^2} = \log_b 7 - \log_b 8xy^2$

$= \log_b 7 - [\log_b 8 + \log_b x + \log_b y^2]$

$= \log_b 7 - \log_b 8 - \log_b x - \log_b y^2$

$= \log_b 7 - \log_b 8 - \log_b x - 2\log_b y$

Exercise 4: Use the properties of logarithms to rewrite each expression as a single logarithm.

a) $3 \log_b (xy) - 5 \log_b z$

$$3 \log_b (xy) - 5 \log_b z = \log_b (xy)^3 - \log_b z^5$$

$$= \log_b \frac{(xy)^3}{z^5}$$

b) $\frac{1}{2} \log_b (x - 3) + 3 \log_b (y + 1) - \log_b (2z - 5)$

$$\frac{1}{2} \log_b (x - 3) + 3 \log_b (y + 1) - \log_b (2z - 5) = \log_b (x - 3)^{1/2} + \log_b (y + 1)^3 - \log_b (2z - 5)$$

$$= \log_b \sqrt{x-3} + \log_b (y + 1)^3 - \log_b (2z - 5)$$

$$= \log_b \sqrt{x-3}(y+1)^3 - \log_b (2z - 5)$$

$$= \log_b \frac{\sqrt{x-3}(y+1)^3}{2z-5}$$

Exercise 5: Evaluate the following logarithm by using the change-of-base formula.

$\log_4 27$

$$\log_4 27 = \frac{\log 27}{\log 4}$$

$$\approx 2.377$$