Unit 3: Exponential and Logarithmic Functions

Activity 4: Properties and Laws of Logarithmic Functions

Formative Assignment

1. Evaluate the following:

    a. $\log_4 2 + \log_4 8$

    b. $\log_6 4 + \log_6 9$

    c. $\log_3 324 - \log_3 4$

    d. $\log_3 9^5$

    e. $\log_6 \dfrac{1}{36} - \log_3 \dfrac{1}{243}$

2. Write the following as a single logarithm:

    a. $\log_2 2 + 3\log_2 4 - \log_2 16$

    b. $\log_3 4 + \log_3 6 - \log_3 8 + 3\log_3 2$

3. Evaluate the following:

    a. $\log_3(27^3 \sqrt{81}) - \log_2(16^4 \sqrt{128})$

    b. $\log_4(16^3 \sqrt{64}) - \log_5(625^4 \sqrt{5})$

Formative Assignment: SOLUTIONS

1. Evaluate the following:

   a. $\log_4 2 + \log_4 8 = \log_4 16 = 2$

   b. $\log_6 4 + \log_6 9 = \log_6 36 = 2$

   c. $\log_3 324 - \log_3 4 = \log_3 81 = 4$

   d. $\log_3 9^5 = \log_3 \left(3^2\right)^5 = \log_3 3^{10} = 10$

   e. $\log_6 \dfrac{1}{36} - \log_3 \dfrac{1}{243} = \log_6 6^{-2} - \log_3 3^{-5} = -2 - (-5) = 3$

2. Write the following as a single logarithm:

   a. $\log_2 2 + 3\log_2 4 - \log_2 16 = \log_2 2 + \log_2 4^3 - \log_2 16 = \log_2 \left(\dfrac{2 \times 4^3}{16}\right) = \log_2 8$

   b. $\log_3 4 + \log_3 6 - \log_3 8 + 3\log_3 2 = \log_3 4 + \log_3 6 - \log_3 8 + \log_3 2^3 = \log_3 \left(\dfrac{4 \times 6 \times 8}{8}\right) = \log_3 24$

3. Evaluate the following:

   a. $\log_3(27^3 \sqrt{81}) - \log_2(16^4 \sqrt{128})$

   $= \log_3 \left[\left(3^3\right)^3 \times \left(3^4\right)^{\frac{1}{2}}\right] - \log_2 \left[\left(2^4\right)^4 \times \left(2^7\right)^{\frac{1}{2}}\right]$

   $= \log_3 \left(3^9 \times 3^2\right) - \log_2 \left[2^{16} \times 2^{\frac{7}{2}}\right]$

   $= \log_3 3^{11} - \log_2 2^{\frac{39}{2}}$

   $= 11 - \dfrac{39}{2}$

   $= -\dfrac{17}{2}$

   b. $\log_4(16^3 \sqrt{64}) - \log_5(625^4 \sqrt{5})$

   $= \log_4 \left[\left(4^2\right)^3 \times \left(4^3\right)^{\frac{1}{2}}\right] - \log_5 \left[(5^4)^4 \times 5^{\frac{1}{2}}\right]$

   $= \log_4 \left(4^6 \times 4^{\frac{3}{2}}\right) - \log_5 5^{\frac{33}{2}}$

   $= \dfrac{15}{2} - \dfrac{33}{2}$

   $= -9$