

4.3 - The Logarithmic Function

Review problems

1. **Operations on exponents.** Simplify. Write answers with only positive exponents.

$$(a) (8x^4y^8)^{-2/3} \quad (b) \frac{2^4 \cdot 5^{-1}}{2 \cdot 5^2}$$

Basic knowledge

2. Evaluate each expression or state that the value is undefined:

$$(a) \log_2(16) \quad (b) \log_8(2) \quad (c) \log_4\left(\frac{1}{16}\right)$$

$$(f) \log_{-2}(-8) \quad (g) \ln(e) \quad (i) \log(0) \quad (j) \ln(1)$$

3. Sketch the graph of each function. Label the asymptote (if any) and at least two points on each graph.

$$(a) y = \log_2(x - 3) \quad (b) y = -\ln(x - 2) + 4 \quad (c) y = \log_9 \frac{1}{3}$$

4. Solve each equation:

$$(a) \log_2(x) = 3 \quad (b) \log_3(x^2 - 3x + 1) = 0$$

Intermediate

5. Solve equations:

$$(a) \log_{1/2}(x^2 - 3) = 2 \quad (b) 2 \ln(x + 4) - 6 = 0$$

6. The population of bacteria is decreasing according to the function $P(t) = 300 \cdot 2^{-t}$, where t is the number of hours since the beginning of an experiment, and P is the bacteria count. How long will it take bacteria population to decrease to 75?

Advanced

7. Sketch the graph of the following function. Label the asymptote and at least two points on the graph.

$$y = -3 - 4 \log_{1/2}(x + 1)$$

8. How long will it take for \$100 to double if you invest it at 5% compounded annually? (Hint: find the formula for compound interest - section 4.2 in the textbook)