In this worksheet you will develop a solid understanding of logarithms, the inverse of exponential functions, and learn how to work with them. You will practice converting between logarithmic and exponential forms, solving basic logarithmic equations, and explaining the fundamental relationship between exponentials and logarithms.

Easy Questions

1. Evaluate $\log_{10}(100)$.

2. Write the exponential statement $2^3 = 8$ in logarithmic form.

3. Express $\log_3(x) = 4$ in exponential form.

4. Evaluate $\log_{10}(1)$.

5. Solve for x if $\log_5(x) = 2$.

Intermediate Questions

6. Convert the exponential equation $2^x = 32$ to logarithmic form and determine the value of x.

7. Write $\log_4(64)$ in its equivalent exponential form and find its value.

8. Determine the value of $\log_b(b)$.

9. Find $\log_7(1)$.

10. Evaluate $\log_2(16)$.

11. Calculate $\log_5(125)$.

12. Express $\log_2(8)$ in exponential form and state its value.

13. If $\log_x(16) = 4$, find the value of x.

14. If $\log_3(81) = k$, determine the value of k.

15. Evaluate $\log_6(6)$.

16. Write the equation $10^x = 1000$ in logarithmic form and find x.

17. Evaluate $\log_b\left(b^7\right)$.

18. If $y = \log_2(32)$, determine the value of y.

19. In your own words, write the definition of a logarithm.

20. Explain the relationship between an exponential function and its logarithmic inverse.

Hard Questions

21. Refer to the diagram below and identify the x-intercept and vertical asymptote of $y = \log_2(x)$.
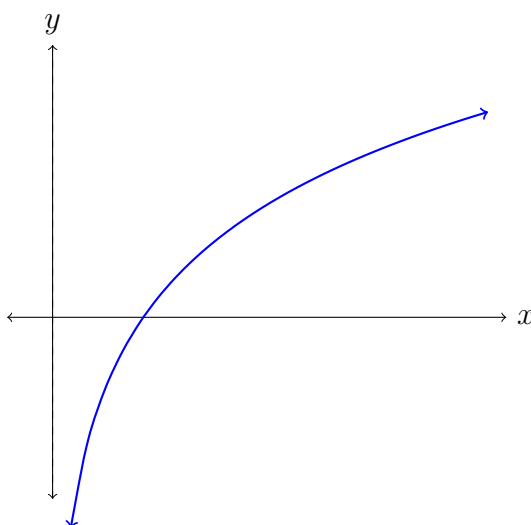
22. Solve for b if $\log_b(81) = 4$.

23. Solve for x if $\log_x(16) = 2$.

24. Prove that $\log_b\left(b^3\right) = 3$ for any valid base b.

25. Explain why the function $\log_b(x)$ is only defined for $x > 0$.

26. Given that $\log_b(a) = c$, express a in exponential form.

27. In your own words, state what it means to say "a logarithm is the inverse of an exponential function".

28. Evaluate $\log_3\left(\dfrac{1}{27}\right)$ by writing the expression in exponential form.

29. Solve for x in $\log_5(x) = -1$.

30. Write a brief explanation describing the relationship between the graphs of an exponential function and its logarithmic inverse, particularly in relation to the line $y = x$.