

Unit 3

Learning Target 3

I can rewrite and evaluate exponential and logarithm expressions.

What is a logarithm?

The exponent to which a number must be raised in order to get some other number.

$$\log_2 4 = 2$$

↙ argument
↖ exponent
↑ base

Log base 2 of 4 is 2

Common Log

log 25

Base is 10

Natural Log

ln 8

Base is e

Logarithmic Form

$$\log_b y = x$$

Exponential Form

$$b^x = y$$

Rewrite in exponential form.

$$1) \log_5 625 = 4$$

$$5^4 = 625$$

$$2) \log_2 \frac{1}{8} = -3$$

$$2^{-3} = \frac{1}{8}$$

Rewrite in logarithmic form.

$$3) 4^{-2} = \frac{1}{16}$$

$$\log_4 \frac{1}{16} = -2$$

$$4) \left(\frac{1}{3}\right)^{-2} = 9$$

$$\log_{\frac{1}{3}} 9 = -2$$

Change of Base

$$\log_2 6 = \frac{\log 6}{\log 2}$$
$$= \frac{\text{log argument}}{\text{log base}}$$

Evaluate.

1.) $\log_7 1 = 0$

2.) $2^{\log_2 18} = 18$

3.) $\log_7 \frac{1}{49} = -2$

4.) $\log_2 2^9 = 9$

5.) $\ln e^7 = 7$

6.) $\log_8 56 = 1.93$

7.) $\log 100 = 2$

8.) $\ln 5.67 = 1.7$

In Exercises 1–18, evaluate the logarithmic expression without using a calculator.

1. $\log_4 4 = 1$

2. $\log_6 1 = 0$

3. $\log_2 32 = 5$

4. $\log_3 81 = 4$

7. $\log 10^3 = 3$

8. $\log 10,000 = 4$

9. $\log 100,000 = 5$

10. $\log 10^{-4} = -4$

13. $\ln e^3 = 3$

14. $\ln e^{-4} = -4$

15. $\ln \frac{1}{e} = -1$

16. $\ln 1 = 0$

In Exercises 19–24, evaluate the expression without using a calculator.

19. $7^{\log_7 3}$

20. $5^{\log_5 8}$

21. $10^{\log(0.5)}$

22. $10^{\log 14}$

23. $e^{\ln 6}$

24. $e^{\ln(1/5)}$

In Exercises 25–32, use a calculator to evaluate the logarithmic expression if it is defined, and check your result by evaluating the corresponding exponential expression.

25. $\log 9.43$

26. $\log 0.908$

27. $\log(-14)$

28. $\log(-5.14)$

29. $\ln 4.05$

30. $\ln 0.733$

31. $\ln(-0.49)$

32. $\ln(-3.3)$

In Exercises 23–28, use the change-of-base formula and your calculator to evaluate the logarithm.

23. $\log_2 7$

24. $\log_5 19$

25. $\log_8 175$

26. $\log_{12} 259$

27. $\log_{0.5} 12$

28. $\log_{0.2} 29$

HOMework

pg. 281: 1-4, 7-10, 13-16, 19-32

pg. 289: 23-28 (Change-of-Base)