

3.3 Logarithmic Functions & Their Graphs

Target 3B: Know and understand the inverse relationships of exponential and logarithmic equations



SAT Connection

Passport to Advanced Math

14. Use structure to isolate or identify a quantity of interest in an expression

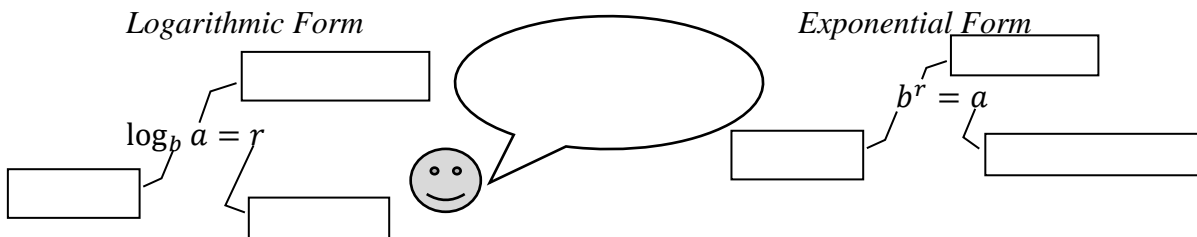
Example: Jessica opened a bank account that earns 2 percent interest compounded annually. Her initial deposit was \$100, and she uses the expression $\$100(x)^t$ to find the value of the account after t years. What is the value of x in the expression?

/	○	○	
.	○	○	○
0	○	○	○
1	○	○	○
2	○	○	○
3	○	○	○
4	○	○	○
5	○	○	○
6	○	○	○
7	○	○	○
8	○	○	○
9	○	○	○

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

Solution

Logarithmic Functions



Examples

Evaluate the logarithmic expression.

1. $\log_3 9$

2. $\log_3 \frac{1}{27}$

3. $\log_2 \sqrt{8}$

4. $\ln e^2$

Common Log → has base _____

Natural Log → has base _____

Examples

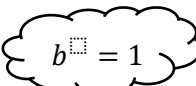

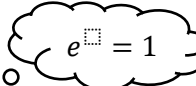
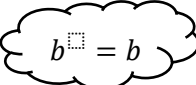

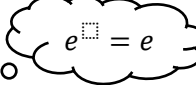
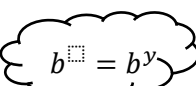

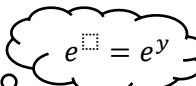
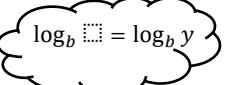

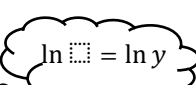
Using a calculator, evaluate the logarithmic expression.

1. $\log 4$

2. $\ln 2$

3. $\log_2 5$

Properties of Logs/Natural Logs

$\log_b 1 = \underline{\hspace{2cm}}$				$\ln 1 = \underline{\hspace{2cm}}$
$\log_b b = \underline{\hspace{2cm}}$				$\ln e = \underline{\hspace{2cm}}$
$\log_b b^y = \underline{\hspace{2cm}}$				$\ln e^y = \underline{\hspace{2cm}}$
$b^{\log_b y} = \underline{\hspace{2cm}}$				$e^{\ln y} = \underline{\hspace{2cm}}$

Examples

Using the properties of logarithms, evaluate the logarithmic expression.

1. $\log_3 9$

2. $\log_5 125$

3. $e^{\ln 4}$

4. $5^{\log_5 8}$

5. $\log_4 1$

6. $\log_{10} \frac{1}{100}$

7. $\ln e^8$

8. $x^{\log_x 7}$

Solve the equation for x .

9. $\log x = 5$

10. $2 \log x = -6$

11. $\ln x^2 = 4$

More Practice

Logarithms

<https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/introduction-to-logarithms/a/intro-to-logarithms>

<http://www.themathpage.com/aprecalc/logarithmic-exponential-functions.htm>

<http://www.sosmath.com/algebra/logs/log4/log41/log41.html>

<http://www.regentsprep.org/regents/math/algtrig/ATE9/logs.htm>

https://youtu.be/Z5myJ8dg_rM

Homework Assignment

p.281 #1-35odd,59,62

SAT Connection**Solution**

The correct answer is 1.02. The initial deposit earns 2 percent interest compounded annually. Thus at the end of 1 year, the new value of the account is the initial deposit of \$100 plus 2 percent of the initial deposit: $\$100 + \frac{2}{100}(\$100) = \$100(1.02)$. Since the interest is compounded annually, the value at the end of each succeeding year is the sum of the previous year's value plus 2 percent of the previous year's value. This is again equivalent to multiplying the previous year's value by 1.02. Thus, after 2 years, the value will be $\$100(1.02)(1.02) = \$100(1.02)^2$; after 3 years, the value will be $\$100(1.02)^3$; and after t years, the value will be $\$100(1.02)^t$. Therefore, in the formula for the value for Jessica's account after t years, $\$100(x)^t$, the value of x must be 1.02.