

7-5

Reteaching

Exponential and Logarithmic Equations

Use logarithms to solve exponential equations.

Problem

What is the solution of $7 - 5^{2x-1} = 4$?

$$7 - 5^{2x-1} = 4$$

$$-5^{2x-1} = -3$$

First isolate the term that has the variable in the exponent. Begin by subtracting 7 from each side.

$$5^{2x-1} = 3$$

Multiply each side by -1 .

$$\log_5 5^{2x-1} = \log_5 3$$

Because the variable is in the exponent, use logarithms. Take \log_5 of each side because 5 is the base of the exponent.

$$(2x - 1) \log_5 5 = \log_5 3$$

Use the Power Property of Logarithms.

$$2x - 1 = \log_5 3$$

Simplify. (Recall that $\log_b b = 1$.)

$$2x - 1 = \frac{\log 3}{\log 5}$$

Apply the Change of Base Formula.

$$2x = \frac{\log 3}{\log 5} + 1$$

Add 1 to each side.

$$x = \frac{1}{2} \left(\frac{\log 3}{\log 5} + 1 \right)$$

Divide each side by 2.

$$x \approx 0.84$$

Use a calculator to find a decimal approximation.

Exercises

Solve each equation. Round the answer to the nearest hundredth.

1. $2^x = 5$

2. $10^{2x} = 8$

3. $5^{x+1} = 25$

4. $2^{x+3} = 9$

5. $3^{2x-3} = 7$

6. $4^x - 5 = 3$

7. $5 + 2^{x+6} = 9$

8. $4^{3x} + 2 = 3$

9. $1 - 3^{2x} = -5$

10. $2^{3x} - 2 = 13$

11. $5^{2x+7} - 1 = 8$

12. $7 - 2^{x+7} = 5$

7-5

Reteaching (continued)

Exponential and Logarithmic Equations

Use exponents to solve logarithmic equations.

Problem

What is the solution of $8 - \log(4x - 3) = 4$?

$$8 - \log(4x - 3) = 4$$

$$-\log(4x - 3) = -4$$

First isolate the term that has the variable in the logarithm. Begin by subtracting 8 from each side.

$$\log(4x - 3) = 4$$

Multiply each side by -1 .

$$4x - 3 = 10^4$$

Write in exponential form.

$$4x - 3 = 10,000$$

Simplify.

$$4x = 10,003$$

Add 3 to each side.

$$x = \frac{10,003}{4}$$

Solve for x .

$$x = 2500.75$$

Divide.

Exercises

Solve each equation. Round the answer to the nearest thousandth.

13. $\log x = 2$

14. $\log 3x = 3$

15. $\log 2x + 2 = 6$

16. $5 + \log(2x + 1) = 6$

17. $\log 5x + 62 = 62$

18. $6 - \log \frac{1}{2}x = 3$

19. $\log(4x - 3) + 6 = 4$

20. $\frac{2}{3}\log 5x = 2$

21. $2 \log 250x - 6 = 4$

22. $5 - 2 \log x = \frac{1}{2}$