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. $2^x = 5$ **2.32**

2. $10^{2x} = 8$ **0.45**

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

4. $2^{x+3} = 9$ **0.17**

5. $3^{2x-3} = 7$ **2.39**

6. $4^x - 5 = 3$ **1.50**

7. $5 + 2^{x+6} = 9$ **−4**

8. $4^{3x} + 2 = 3$ **0**

9. $1 - 3^{2x} = -5$ **0.82**

10. $2^{3x} - 2 = 13$ **1.30**

11. $5^{2x+7} - 1 = 8$ **−2.82**

12. $7 - 2^{x+7} = 5$ **−6**

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. $\log x = 2$ **100**

14. $\log 3x = 3$ **333.333**

15. $\log 2x + 2 = 6$ **5000**

16. $5 + \log{(2x + 1)} = 6$ **4.5**

17. $\log 5x + 62 = 62$ **0.2**

18. $6 - \log{\frac{1}{2}x} = 3$ **2000**

19. $\log{(4x - 3)} + 6 = 4$ **0.753**

20. $\frac{2}{3}\log 5x = 2$ **200**

21. $2\log 250x - 6 = 4$ **400**

22. $5 - 2\log x = \frac{1}{2}$ **177.828**