

Solve each equation. Check for extraneous solutions. YOU MUST SHOW YOUR WORK.

1. $\log_5(2x + 15) = \log_5 3x$

$$\begin{array}{r} 2x + 15 = 3x \\ -2x \quad -2x \\ \hline 15 = x \end{array}$$

CHECK: $\log_5(2 \cdot 15 + 15) = \log_5 3 \cdot 15$
 $\log_5(30 + 15) = \log_5 45$
 $\log_5(45) = \log_5 45$

2. $\log_9(5 - 3x) = \log_9(4x - 9)$

$$\begin{array}{r} 5 - 3x = 4x - 9 \\ +3x \quad +3x \\ \hline 5 = 7x - 9 \\ +9 \quad +9 \\ \hline 14 = 7x \\ \frac{14}{7} = \frac{7x}{7} \quad x = 2 \end{array}$$

CHECK: $\log_9(5 - 3(2)) = \log_9(4 \cdot 2 - 9)$
 $\log_9(5 - 6) = \log_9(8 - 9)$
 $\log_9(-1) = \log_9(-1)$
NO SOLUTION

3. $\log_4(4x + 1) = \log_4(2x + 5)$

$$\begin{array}{r} 4x + 1 = 2x + 5 \\ -2x \quad -2x \\ \hline 2x + 1 = 5 \\ -1 \quad -1 \\ \hline 2x = 4 \\ \frac{2x}{2} = \frac{4}{2} \quad x = 2 \end{array}$$

CHECK: $\log_4(4 \cdot 2 + 1) = \log_4(2 \cdot 2 + 5)$
 $\log_4(8 + 1) = \log_4(4 + 5)$
 $\log_4(9) = \log_4(9)$

4. $\log_b(x^2 - 12) = \log_b x$

$$\begin{array}{r} x^2 - 12 = x \\ -x \quad -x \\ \hline x^2 - x - 12 = 0 \end{array}$$

Sum -1	prod. -12
-4 + 3	-4 · 3

$$(x - 4)(x + 3) = 0$$

$x = 4 = 0$ $x = 3 = 0$
 $x = 4$ $x = -3$

CHECK: $x = 4$ $\log_b(4^2 - 12) = \log_b 4$
 $\log_b(16 - 12) = \log_b 4$
 $\log_b(4) = \log_b 4$
 $x = -3$ $\log_b((-3)^2 - 12) \neq \log_b -3$

5. $\log_2 4x^2 = \log_2 100$

$$\begin{array}{r} 4x^2 = 100 \\ \frac{4x^2}{4} = \frac{100}{4} \\ \sqrt{x^2} = \sqrt{25} \\ x = \pm 5 \end{array}$$

CHECK: $x = 5$ $\log_2 4(5)^2 = \log_2 100$
 $\log_2 4 \cdot 25 = \log_2 100$
 $\log_2 100 = \log_2 100$
 $x = -5$ $\log_2 4(-5)^2 = \log_2 100$
 $\log_2 4(25) = \log_2 100$ $\log_2 100 = \log_2 100$