Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Logarithmic Equations

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

1. $\log_9 y + \log_9 7 = \log_9 8$

Domain: real variables $y > 0$

2. $\log_8 z + \log_8 10 = 2$

Domain: real variables $z > 0$

3. $\log_5 2 + \log_5 \left(4 \cdot z^2\right) = \log_5 2$

Domain: real variables $4 \cdot z^2 > 0$

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Logarithmic Equations

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

4. $\log_3\left(7\cdot n^2+21\right)=\log_3\left(28\cdot n\right)$

Domain: real variables $7\cdot n^2+21>0$ $28\cdot n>0$

5. $\log_7\left(3\cdot n\right)=\log_7\left(2\cdot n+5\right)$

Domain: real variables $3\cdot n>0$ $2\cdot n+5>0$

6. $\log_4\left(9\cdot z-9\right)=\log_4\left(8\cdot z-4\right)$

Domain: real variables $9\cdot z-9>0$ $8\cdot z-4>0$

7. $\log_8\left(9\cdot n+5\right)=\log_8\left(6\cdot n-7\right)$

Domain: real variables $9\cdot n+5>0$ $6\cdot n-7>0$

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Logarithmic Equations

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

8. $\log_6 z + \log_6 10 = \log_6 10$

Domain: real variables $z > 0$

9. $\log_9 2 + \log_9 \left(2 \cdot t^2\right) = \log_9 2$

Domain: real variables $2 \cdot t^2 > 0$

10. $\log_3 \left(9 \cdot x^2 + 18\right) = \log_3 \left(-27 \cdot x\right)$

Domain: real variables $9 \cdot x^2 + 18 > 0$ $-27 \cdot x > 0$

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Logarithmic Equations

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

11. $\log_4 z + \log_4 9 = 2$

Domain: real variables $z > 0$

12. $\log_3(4 \cdot n) = \log_3(5 \cdot n + 6)$

Domain: real variables $4 \cdot n > 0$ $5 \cdot n + 6 > 0$

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Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

1. $\log_9 y + \log_9 7 = \log_9 8$

Domain: real variables $y > 0$

Work:

$7 \cdot y = 8$

Check $y = \frac{8}{7}$

Arguments: $\frac{8}{7}$ 7 8

valid: every original log argument is positive

$y \in \{\frac{8}{7}\}$

2. $\log_8 z + \log_8 10 = 2$

Domain: real variables $z > 0$

Work:

$10 \cdot z = 64$

Check $z = \frac{32}{5}$

Arguments: $\frac{32}{5}$ 10

valid: every original log argument is positive

$z \in \{\frac{32}{5}\}$

3. $\log_5 2 + \log_5 \left(4 \cdot z^2\right) = \log_5 2$

Domain: real variables $4 \cdot z^2 > 0$

Work:

$8 \cdot z^2 = 2$

Check $z = \frac{-1}{2}$

Arguments: 2 1 2

valid: every original log argument is positive

Check $z = \frac{1}{2}$

Arguments: 2 1 2

valid: every original log argument is positive

$z \in \{\frac{-1}{2}, \frac{1}{2}\}$

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Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

4. $\log_3(7 \cdot n^2 + 21) = \log_3(28 \cdot n)$

Domain: real variables $7 \cdot n^2 + 21 > 0$ $28 \cdot n > 0$

Work:

$7 \cdot n^2 + 21 = 28 \cdot n$

Check n = 1

Arguments: 28 28

valid: every original log argument is positive

Check n = 3

Arguments: 84 84

valid: every original log argument is positive

$n \in \{1, 3\}$

5. $\log_7(3 \cdot n) = \log_7(2 \cdot n + 5)$

Domain: real variables $3 \cdot n > 0$ $2 \cdot n + 5 > 0$

Work:

$3 \cdot n = 2 \cdot n + 5$

Check n = 5

Arguments: 15 15

valid: every original log argument is positive

$n \in \{5\}$

6. $\log_4(9 \cdot z - 9) = \log_4(8 \cdot z - 4)$

Domain: real variables $9 \cdot z - 9 > 0$ $8 \cdot z - 4 > 0$

Work:

$9 \cdot z - 9 = 8 \cdot z - 4$

Check z = 5

Arguments: 36 36

valid: every original log argument is positive

$z \in \{5\}$

7. $\log_8(9 \cdot n + 5) = \log_8(6 \cdot n - 7)$

Domain: real variables $9 \cdot n + 5 > 0$ $6 \cdot n - 7 > 0$

Work:

$9 \cdot n + 5 = 6 \cdot n - 7$

Check n = -4

Arguments: -31 -31

extraneous: an original log argument is nonpositive

No real solution

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Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

8. $\log_6 z + \log_6 10 = \log_6 10$

Domain: real variables $z > 0$

Work:

$10 \cdot z = 10$

Check z = 1

Arguments: 1 10 10

valid: every original log argument is positive

$z \in \{1\}$

9. $\log_9 2 + \log_9 \left(2 \cdot t^2\right) = \log_9 2$

Domain: real variables $2 \cdot t^2 > 0$

Work:

$4 \cdot t^2 = 2$

Check t = $\frac{-1}{2} \cdot \sqrt{2}$

Arguments: 2 1 2

valid: every original log argument is positive

Check t = $\frac{1}{2} \cdot \sqrt{2}$

Arguments: 2 1 2

valid: every original log argument is positive

$t \in \{\frac{-1}{2} \cdot \sqrt{2}, \frac{1}{2} \cdot \sqrt{2}\}$

10. $\log_3 \left(9 \cdot x^2 + 18\right) = \log_3 \left(-27 \cdot x\right)$

Domain: real variables $9 \cdot x^2 + 18 > 0$ $-27 \cdot x > 0$

Work:

$9 \cdot x^2 + 18 = -27 \cdot x$

Check x = -2

Arguments: 54 54

valid: every original log argument is positive

Check x = -1

Arguments: 27 27

valid: every original log argument is positive

$x \in \{-2, -1\}$

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Logarithmic Equations

Answer Key

Use logarithm laws, solve the resulting equation, and check every candidate in the original logarithms.

11. $\log_4 z + \log_4 9 = 2$

Domain: real variables $z > 0$

Work:

$9 \cdot z = 16$

Check z = $\frac{16}{9}$

Arguments: $\frac{16}{9}$ 9

valid: every original log argument is positive

$z \in \left\{\frac{16}{9}\right\}$

12. $\log_3(4 \cdot n) = \log_3(5 \cdot n + 6)$

Domain: real variables $4 \cdot n > 0$ $5 \cdot n + 6 > 0$

Work:

$4 \cdot n = 5 \cdot n + 6$

Check n = -6

Arguments: -24 -24

extraneous: an original log argument is nonpositive

No real solution