

Logarithm Worksheet

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Name: Key

Part A - Equations

1. $9^{2x-1} = 27^{x+2}$

$3^{4x-2} = 3^{3x+6}$

$x = 8$

$4x - 2 = 3x + 6$

$x = 8$

2. $\log_3(x^2 - 7) = 2$

$3^2 = x^2 - 7$

$x^2 = 16$

$x = \pm 4$

$x = \pm 4$

3. $x + 3x^{\frac{1}{2}} + 2 = 0$

$(x^{\frac{1}{2}} + 2)(x^{\frac{1}{2}} + 1)$

$x^{\frac{1}{2}} = -1, -2$

No answer

4. $\log_x \sqrt{3} = \frac{1}{4}$

$(x^{\frac{1}{4}})^4 = (3^{\frac{1}{2}})^4$

$x = 3^2$

$x = 9$

5. $8^{n-1} = \left(\frac{1}{4}\right)^{n+3}$

$2^{3n-3} = 2^{-2n-6}$

$3n - 3 = -2n - 6$

$5n = -3$

$n = -\frac{3}{5}$

6. $(x^{-1})^{\frac{3}{4}} = 27$

$(x^{-\frac{3}{4}})^{\frac{4}{3}} = 27^{\frac{4}{3}}$

$x = 0.01234$

or $x = \frac{1}{81}$

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$$7. \left(\frac{4}{5}\right)^{x-3} = \left(\frac{5}{4}\right)^{x+1}$$

$$\left(\frac{5}{4}\right)^{-x+3} = \left(\frac{5}{4}\right)^{x+1}$$

$$-x + 3 = x + 1$$

$$2 = 2x$$

$$x = 1$$

$$8. \log_5 x^3 = \log_5 20 + \log_5 10 - \log_5 25$$

$$\log_5 x^3 = \log_5 \left(\frac{200}{25}\right)$$

$$x^3 = 8$$

$$x = 2$$

$$x = 2$$

$$9. \log_2 x = 6$$

$$x = 2^6$$

$$x = 64$$

$$x = 64$$

$$10. 2\log_4 x = \frac{1}{2}\log_4 16 + 2\log_4 5$$

$$\log_4 x^2 = \log_4 4 + \log_4 25$$

$$\log_4 x^2 = \log_4 100$$

$$x^2 = 100$$

$$x = \pm 10 \quad \underline{\text{Reject } -10}$$

$$x = 10$$

Part B - Equations (base 10). Give both a) and EXACT answer and b) a 4 decimal place approximation for x.

1. $\log x = 3.275$

$$x = 10^{3.275}$$

$$\underline{x = 1883.6491}$$

2. $\log(3x) = -2$

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

$$x = \frac{1}{300}$$

$$\underline{x = 0.0033}$$

3. $\log(x+3) = 2.52$

$$10^{2.52} = x+3$$

$$x = 10^{2.52} - 3$$

$$\underline{x = 328.1311}$$

4. $5\log(x-7) - 8 = 7$

$$\log(x-7) = 3$$

$$10^3 = x-7$$

$$x = 10^3 + 7$$

$$\underline{x = 1007}$$

5. $\log(x^2 + 4) = 2$

$$10^2 = x^2 + 4$$

$$x = \pm \sqrt{96}$$

$$\underline{x = \pm 9.7980}$$

Part C - Equations (base a). Solve for x.

1. $(x^3)^{\frac{1}{3}} = 17^{\frac{1}{3}}$

$$\underline{x = 2.5713}$$

$$2. \left(x^{\frac{3}{5}} = 7\right)^{\frac{5}{3}}$$

$$\underline{x = 25.6151}$$

$$3. 5x^{2.5} - 3 = 0$$
$$\left(x^{2.5}\right)^{\frac{1}{2.5}} = \left(\frac{3}{5}\right)^{\frac{1}{2.5}}$$

$$\underline{x = 0.8152}$$

$$4. 6x^{-4.7} - 7 = 10$$

$$6x^{-4.7} = 17$$

$$x = \left(\frac{17}{6}\right)^{-\frac{1}{4.7}} = .8012$$

$$\underline{x = .8012}$$

$$5. \log_x 7 = 3$$

$$x^3 = 7$$

$$x = \sqrt[3]{7}$$

$$\underline{x = 1.9129}$$

$$6. \log_x 5 = 2.15$$

$$\left(x^{2.15}\right)^{\frac{1}{2.15}} = \left(5\right)^{\frac{1}{2.15}}$$

$$x = 2.1140$$

$$\underline{x = 2.1140}$$

$$7. 2\log_x 24 - 5 = 8$$

$$\log_x 24 = \frac{13}{2}$$

$$x^{13/2} = 24$$

$$x = (24)^{2/13}$$

$$\underline{x = 1.6306}$$

$$8. \log_x(-5) = 3$$

$$x^3 = -5$$

No answer

base
can't be
negative

$$9. \log_5(-x) = 3$$

$$5^3 = -x$$

$$\underline{x = -125}$$

$$10. \log_3 x = 2.5$$

$$3^{2.5} = x$$

$$\underline{x = 15.5885}$$

$$11. 3\log_5(x+7) - 9 = 0$$

$$\log_5(x+7) = 3$$

$$5^3 = x+7$$

$$\underline{x = 118}$$

$$x = 125 - 7$$

$$12. 5 - 2\log_7 x = 7$$

$$-2\log_7 x = 2$$

$$\log_7 x = -1$$

$$\underline{x = \frac{1}{7}}$$