

Name _____ Date _____ Period _____

Worksheet 4.5—Exponential and Log Equations

Show all work on a separate sheet of paper. All answers must be given as either simplified, exact answers. No calculator is permitted unless otherwise stated.

Multiple Choice

- Solve $2^{3x-1} = 32$
(A) $x = 1$ (B) $x = 2$ (C) $x = 4$ (D) $x = 11$ (E) $x = 13$
- Solve $\ln x = -1$
(A) $x = -1$ (B) $x = \frac{1}{e}$ (C) $x = 1$ (D) $x = e$ (E) DNE
- The domain of the function $f(x) = \log_4(5x+3) - 2$ over the set of real numbers is
(A) $(-1.4, \infty)$ (B) $(-0.6, \infty)$ (C) $(-\infty, \infty)$ (D) $(-2.6, \infty)$ (E) $\left(-1\frac{2}{3}, \infty\right)$
- If $B = \ln\left(\frac{1}{1-x}\right) + \ln\left(\frac{1}{1+x}\right)$, then $e^B =$
(A) $\ln\left(\frac{1}{1-x^2}\right)$ (B) $\frac{2}{1-x^2}$ (C) $\frac{x}{1-x^2}$ (D) $\ln\left(\frac{x}{1-x^2}\right)$ (E) $\frac{1}{1-x^2}$
- If $\log_3(x+3) + \log_3 x = \log_3 28$, then x equals
(A) 3 (B) 4 (C) 7 (D) 12 (E) 21
- If $3^{x+y} = 9$ and $3^{x-y} = 9$ then xy equals
(A) 6 (B) 0 (C) 5 (D) 7.2 (E) 1
- Evaluate $(\log_2 4)(\log_4 8)(\log_8 16)$
(A) 2 (B) 4 (C) 8 (D) (E) 32
- If $(\log_a b)(\log_b 3)(\log_3 d)(\log_d 0.125) = -1.5$, then the value of a is
(A) -5 (B) 5 (C) 4 (D) -4 (E) 0.5
- If $\frac{1}{25}$ of 5^{20} is 125^x , then the value of x is
(A) -3 (B) 5^3 (C) -5 (D) 6 (E) 2^3
- If $5^{x+y} = 6$ and $5^{x-y} = 4$, then $25^x = ?$
(A) $2\sqrt{6}$ (B) 10 (C) 20 (D) 24 (E) 125

Short Answer:

11. For each of the following, find the simplified, exact solution accompanied by a three-decimal approximation (if applicable).

(a) $2 \cdot 3^{x/4} = 5 \cdot 7^{(1-x)}$ (b) $\frac{10}{1-e^{-x}} = 2$ (c) $4x^3 e^{3x} = 3x^4 e^{3x}$ (d) $e^x - 12e^{-x} - 1 = 0$

(e) $\log_2 3 + \log_2 x = \log_2 5 + \log_2 (x-2)$ (f) $\log_5 (x+1) - \log_5 (x-1) = 2$

(g) $\log_9 (x-5) + \log_9 (x+3) = 1$

12. Using a **calculator**, solve each of the following to 3 decimals:

(a) $\log_9 x = x^2 - 2$ (b) $e^{x^2} - 2 > x^3 - x$

13. Evaluate each of the following:

(a) $\log_{49} 7 - \log_8 64$ (b) $\log_3 \sqrt{243 \sqrt{81 \sqrt[3]{3}}}$

14. Solve for x :

(a) $2 \log_b x = 2 \log_b (1-a) + 2 \log_b (1+a) - \log_b \left(\frac{1}{a} - a \right)^2$

(b) $\log_b x = 2 - a + \log_b \left(\frac{a^2 b^a}{b^2} \right)$ (c) $\log_2 (x-4) + \log_{\sqrt{2}} (x^3 - 2) + \log_{1/2} (x-4) = 20$

(d) $\log_5 (\ln(x+3) - 1) + \log_{1/5} (\ln(x+3) - 1) = 0$

15. Find the x - and y -intercepts of the following, then sketch the graphs.

(a) $y = 2 \log_3 (x+1)$ (b) $y = 5 - 4^{x+3}$

16. Find the inverse of the following functions.

(a) $g(x) = 5 + \log_3 (2x+2)$ (b) $f(x) = e^{x+2} - 1$

17. Solve the following **literal equations** for the indicated variable.

(a) $T = T_s + D_0 e^{-kt}$ for k . (b) $y = \frac{a}{1 + b e^{-(x-c)/d}}$ for d (c) $y = a e^{-(x-b)^2/c}$ for c