

Name _____ Date _____ Period _____

Worksheet 4.5—Exponential and Log Equations

Show all work. All answers must be given as either simplified, exact answers. No calculator is permitted unless otherwise stated.

Multiple Choice1. Solve $2^{3x-1} = 32$

- (A)
- $x = 1$
- (B)
- $x = 2$
- (C)
- $x = 4$
- (D)
- $x = 11$
- (E)
- $x = 13$

2. Solve $\ln x = -1$

- (A)
- $x = -1$
- (B)
- $x = \frac{1}{e}$
- (C)
- $x = 1$
- (D)
- $x = e$
- (E) DNE

3. 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)
- $\left(-1\frac{2}{3}, \infty\right)$

4. 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) $\frac{1}{1-x^2}$

5. If $\log_3(x+3) + \log_3 x = \log_3 28$, then x equals
(A) 3 (B) 4 (C) 7 (D) 12 (E) 21

6. If $3^{x+y} = 9$ and $3^{x-y} = 9$ then xy equals
(A) 6 (B) 0 (C) 5 (D) 7.2 (E) 1

7. Evaluate $(\log_2 4)(\log_4 8)(\log_8 16)$
- (A) 2 (B) 4 (C) 8 (D) (E) 32

8. 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

9. 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

10. 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).

$$(a) \left(\frac{1}{\sqrt{5}}\right)(125^{2x-1}) = \left(\sqrt[3]{25^2}\right)(5^{-x/2})$$

$$(b) 2 \cdot 3^{x/4} = 5 \cdot 7^{(1-x)}$$

$$(c) \frac{10}{1-e^{-x}} = 2$$

$$(d) 4x^3e^{3x} = 3x^4e^{3x}$$

$$(e) e^x - 12e^{-x} - 1 = 0$$

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

$$(g) \log_5 (x+1) - \log_5 (x-1) = 2$$

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

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) $\log_3 \sqrt{243} \sqrt[3]{81} \sqrt[3]{3}$

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