Name **KEY**

5-7 Notes - Solving with Logs

Date

Solve each equation. Round your answers to the nearest ten-thousandth.

1) $\log_{12}(-2r + 10) = \log_{12}(9 - 3r)$

$$-2r + 10 = 9 - 3r$$
$$\underline{-9-9}$$
$$-2r + 1 = -3r$$
$$\underline{+2r+2r}$$
$$1 = -1r$$
$$\boxed{-1 = r}$$

2) $\log_6(m + 3) = 4$

$$6^4 = m + 3$$
$$1296 = m + 3$$
$$\boxed{1293 = m}$$

3) $7 + \log_9(x - 5) = 11$

$$\underline{-7-7}$$
$$\log_9(x - 5) = 4$$
$$9^4 = x - 5$$
$$6561 = x - 5$$
$$\underline{+5+5}$$
$$\boxed{6566 = x}$$

4) $\log_7 -10m - 4 = -2$

$$\underline{+4+4}$$
$$\log_7 -10m = 2$$
$$7^2 = -10m$$
$$49 = -10m$$
$$\boxed{-4.9 = m}$$

5) $4\log_9 6k = -4$

$$\div 4 \div 4$$
$$\log_9 6k = -1$$
$$9^{-1} = 6k$$
$$.1 = 6k$$
$$\boxed{0.0185 = k}$$

6) $6\ln(2 - 3n) + 8 = 8$

$$\underline{-8-8}$$
$$6\ln(2 - 3n) = 0$$
$$\div 6 \div 6$$
$$\ln(2 - 3n) = 0$$
$$e^0 = 2 - 3n$$
$$1 = 2 - 3n$$
$$\underline{-1-3n}$$
$$\boxed{1/3 = n}$$

7) $-3\log_{11}(10 - 7x) + 10 = 10$

$$\underline{\phantom{-3\log_{11}(10-7x)+}-10-10}$$
$$-3\log_{11}(10 - 7x) = 0$$
$$\div -3 \phantom{\log_{11}(10-7x)=}\div -3$$
$$\log_{11}(10 - 7x) = 0$$
$$11^0 = 10 - 7x$$
$$1 = 10 - 7x$$
$$-9 = -7x$$
$$\boxed{9/7 = x}$$

8) $-8\ln(-10x - 3) - 6 = -14$

$$\underline{+6+6}$$
$$-8\ln(-10x - 3) = -8$$
$$\div 8 \div -8$$
$$\ln(-10x - 3) = 1$$
$$e^1 = -10x - 3$$
$$2.718 = -10x + -3$$
$$\underline{+3+3}$$
$$5.718 = -10x$$
$$\boxed{-0.5718 = x}$$

9) $\log_7 2x - \log_7 5 = 1$

$\log_7\left(\dfrac{2x}{5}\right) = 1$

$7^1 = \dfrac{2x}{5}$

$35 = 2x$

$\boxed{17.5 = x}$

10) $\ln 4 + \ln (x + 8) = 4$

$\ln\left(4(x+8)\right) = 4$

$\ln(4x + 32) = 4$

$e^4 = 4x + 32$

$54.598 = 4x + 32$

$\boxed{5.65 = x}$

11) $\log_8 (x + 6) - \log_8 3 = 2$

$\log_8\left(\dfrac{x+6}{3}\right) = 2$

$8^2 = \dfrac{x+6}{3}$

$64 = \dfrac{x+6}{3}$

$192 = x + 6$

$\boxed{186 = x}$

12) $\ln (x - 2) - \ln 4 = 5$

$\ln\left(\dfrac{x-2}{4}\right) = 5$

$e^5 = \dfrac{x-2}{4}$

$148.413 = \dfrac{x-2}{4}$

$593.653 = x - 2$

$\boxed{595.653 = x}$

13) $3 + 2\log (-10n + 6) = -1$
   $-3 \qquad\qquad\qquad\quad -3$

$\dfrac{2\log(-10n+6)}{\div 2} = \dfrac{-4}{\div 2}$

$\log(-10n+6) = -2$

$10^{-2} = -10n + 6$

$.01 = -10n + 6$

$\boxed{.599 = n}$

14) $4 - \ln (5x + 7) = 3$
   $-4 \qquad\qquad\qquad -4$

$\dfrac{-\ln(5x+7)}{\div -1} = \dfrac{-1}{\div -1}$

$\ln(5x + 7) = 1$

$e^1 = 5x + 7$

$2.718 = 5x + 7$

$\boxed{-.856 = x}$

15) $10^n - 8 = 54$
   $\quad +8 \quad +8$

$10^n = 62$

$\log 62 = n$

$\boxed{1.792 = n}$

16) $e^a + 2 = 69$
   $\qquad -2 \quad -2$

$e^a = 67$

$\ln 67 = a$

$\boxed{4.20 = a}$

17) Change of Base Formula:

$$\log_x y = \dfrac{\log_b y}{\log_b x}$$

Solve each equation. Round your answers to the nearest ten-thousandth.

18) $e^x = 24$

$\ln 24 = x$

$\boxed{3.178 = x}$

19) $10^a = 45$

$\log a = 4$

$\log 45 = a$

$\boxed{1.653 = a}$

20) $8^m + 1 = 23$

$8^m = 22$

$\log_8 22 = m$

$\dfrac{\log 22}{\log 8} = m$

$\boxed{1.486 = m}$

21) $18^r - 3 = 78$

$18^r = 81$

$\log_{18} 81 = r$

$\dfrac{\log 81}{\log 18} = r$

$\boxed{1.520 = r}$

22) $-7 \cdot 16^r + 7 = -81$

$-7 \cdot 16^r = -88$

$16^r = 12.57$

$\log_{16} 12.57 = r$

$\dfrac{\log 12.57}{\log 16} = r$

$\boxed{.913 = r}$

23) $10 \cdot 16^x - 7 = 35$

$10 \cdot 16^x = 42$

$16^x = 4.2$

$\log_{16} 4.2 = x$

$\dfrac{\log 4.2}{\log 16} = x$

$\boxed{.518 = x}$

24) $20^{x-1} + 2 = 12$

$20^{x-1} = 10$

$\log_{20} 10 = x - 1$

$\dfrac{\log 10}{\log 20} = x - 1$

$.769 = x - 1$

$\boxed{1.769 = x}$

25) $-3 \cdot 13^{p+3} = -9.3$

$13^{p+3} = 3.1$

$\log_{13} 3.1 = p + 3$

$\dfrac{\log 3.1}{\log 13} = p + 3$

$.441 = p + 3$

$\boxed{-2.56 = p}$

26) $10 \cdot 17^{9-7m} = 37$

$17^{9-7m} = 3.7$

$\log_{17} 3.7 = 9 - 7m$

$\dfrac{\log 3.7}{\log 17} = 9 - 7m$

$.462 = 9 - 7m$

$\boxed{1.220 = m}$

27) $-6 \cdot 8^{-9a-9} = -59$

$8^{-9a-9} = 9.83$

$\log_8 9.83 = -9a - 9$

$\dfrac{\log 9.83}{\log 8} = -9a - 9$

$1.099 = -9a - 9$

$\boxed{-1.122 = a}$

-3-