Review Lessons 7.5 & 7.6 Worksheet Name: KEY

Use $\log 4 \approx 0.602$ and $\log 7 \approx 0.845$ to evaluate the logarithm.

1.) $\log\frac{7}{4}$

$\log 7 - \log 4$
$0.845 - 0.602$
$\boxed{0.243}$

2.) $\log 28$ $(7 \cdot 4)$

$\log 7 + \log 4$
$0.845 + 0.602$
$\boxed{1.447}$

3.) $\log 256$ (4^4)

$4 \cdot \log 4$
$4(0.602)$
$\boxed{2.408}$

4.) $\log 49$ (7^2)

$\log 7^2$
$2 \cdot \log 7$
$2 \cdot (0.845)$
$\boxed{1.69}$

5.) $\log 112$ $(4^2 \cdot 7)$

$\log 4^2 + \log 7$
$2 \cdot \log 4 + \log 7$
$2(0.602) + (0.845)$
$\boxed{2.049}$

6.) $\log\frac{49}{64}$ $\frac{7^2}{4^3}$

$\log 7^2 - \log 4^3$
$2 \cdot \log 7 - 3 \cdot \log 4$
$2(0.845) - 3(0.602)$
$\boxed{-0.116}$

Expand the expression.

7.) $\log_3 3x$

$\log_3 3 + \log_3 x$
$3^1 = 3$
$\boxed{1 + \log_3 x}$

8.) $\log\frac{2x}{5}$

$\log 2x - \log 5$
$\boxed{\log 2 + \log x - \log 5}$

9.) $\log_7 x^2 y$

$\log_7 x^2 + \log_7 y$
$\boxed{2\log_7 x + \log_7 y}$

10.) $\log\frac{100x^2}{y}$

$10^2 = 100$
$\log 100 + \log x^2 - \log y$
$\boxed{2 + 2\log x - \log y}$

11.) $\ln 5xy^3$

$\ln 5 + \ln x + \ln y^3$
$\boxed{\ln 5 + \ln x + 3\ln y}$

12.) $\log_9 \frac{2x^3}{3}$

$\log_9 2x^3 - \log_9 3$
$9^{\frac{1}{2}} = 3$
$\log_9 2 + \log_9 x^3 - \log_9 3$
$\boxed{\log_9 2 + 3\log_9 x - \frac{1}{2}}$

Condense the expression.

13.) $\log_3 4 + \log_3 2 + \log_3 2$

$\log_3 (4 \cdot 2 \cdot 2)$
$\boxed{\log_3 16}$

14.) $\log 3 + \frac{1}{2}\log x - \log 5$

$\log 3 + \log x^{1/2} - \log 5$
$\log 3\sqrt{x} - \log 5$
$\boxed{\log \frac{3\sqrt{x}}{5}}$

15.) $4 \ln x - 5 \ln x$

$\ln x^4 - \ln x^5$

$\ln \frac{x^4}{x^5}$

$\boxed{\ln \frac{1}{x}}$

16.) $5 \log_4 2 + 7 \log_4 x + 4 \log_4 y$

$\log_4 2^5 + \log_4 x^7 + \log_4 y^4$

$\log_4 (32 \cdot x^7 \cdot y^4)$

$\boxed{\log_4 32x^7y^4}$

17.) $0.5 \ln 100 - 2 \ln x + 8 \ln y$

$\ln 100^{1/2} - \ln x^2 + \ln y^8$

$\ln 10 - \ln x^2 + \ln y^8$

$\boxed{\ln \frac{10y^8}{x^{1/2}}}$

Use the change-of-base formula to evaluate the logarithm. Round to 4 decimal places when necessary.

18.) $\log_3 10$

$\frac{\log 10}{\log 3}$

$\approx \boxed{2.0959}$

19.) $\log_{2.2} 22$

$\frac{\log 22}{\log 2.2}$

$\approx \boxed{3.9204}$

20.) $\log_7 \frac{3}{16}$

$\frac{\log 3/16}{\log 7}$

$\approx \boxed{-0.8603}$

Solve the equation. Check for extraneous solutions. Round your solution to three decimal places if necessary.

21.) $2^{x+1} = 16^{x+2}$

$2^{x+1} = (2^4)^{x+2}$

$2^{x+1} = 2^{4x+8}$

$x + 1 = 4x + 8$

$-3x = 7$

$\boxed{x = -7/3}$

22.) $e^{-x} = 4$

$\cancel{\ln e}^{-x} = \ln 4$

$-x = \ln 4$

$\boxed{x \approx -1.386}$

23.) $3^{2x} + 5 = 13$

$3^{2x} = 12$

$\cancel{\log_3 3}^{2x} = \log_3 12$

$2x = \frac{\log 12}{\log 3}$

$\boxed{x \approx 0.946}$

24.) $3^{x+1} - 5 = 10$

$3^{x+1} = 15$

$\cancel{\log_3} 3^{x+1} = \log_3 15$

$x + 1 = \frac{\log 15}{\log 3}$

$\boxed{x \approx 1.465}$

25.) $\cancel{\log_4}(4x + 7) = \cancel{\log_4} 11x$

$4x + 7 = 11x$

$7 = 7x$

$\boxed{x = 1}$

26.) $\frac{3}{4}e^{3x} - 8 = -6$

$\frac{3}{4}e^{3x} = 2$

$e^{3x} = \frac{8}{3}$

$\cancel{\ln e}^{3x} = \ln \frac{8}{3}$

$3x = \ln \frac{8}{3}$

$\boxed{x \approx 0.327}$

27.) $\cancel{\log_2}(3x - 1) = 8$

$2 \qquad 2$

$3x - 1 = 256$

$3x = 257$

$\boxed{x = \frac{257}{3}}$

28.) $3 \ln x - 7 = 4$

$3 \ln x = 11$

$\cancel{\ln} x = {}^{11}/_{3}$

$\cancel{e} \qquad e$

$\boxed{x \approx 39.121}$

29.) $\ln 3x - \ln 2 = 4$

$\cancel{\ln} \frac{3x}{2} = 4$

$\cancel{e} \qquad e$

$\frac{3x}{2} = e^4$

$3x \approx 109.196$

$\boxed{x \approx 36.399}$

30.) $\log_6(x + 9) + \log_6 x = 2$

$\log_6 (x(x+9)) = 2$

$\cancel{\log_6} (x^2 + 9x) = 2$

$\cancel{6} \qquad 6$

$x^2 + 9x = 36$

$x^2 + 9x - 36 = 0$

$(x + 12)(x - 3) = 0$

extraneous $\rightarrow$ $\boxed{\cancel{x = -12}}$ $\quad \boxed{x = 3}$

31.) The average weight y (in kilograms) of an Atlantic cod from the Gulf of Maine can be modeled by $y = 0.51(1.46)^x$ where x is the age of the cod (in years). Estimate the age of a cod that weighs 15 kilograms.

$x \approx \boxed{8.9 \text{ years old}}$

$15 = 0.51(1.46)^x$

$\frac{15}{0.51} = 1.46^x$

$\log_{1.46} \frac{15}{0.51} = \cancel{\log_{1.46} 1.46}^x$

32.) You deposit \$100 into an account that pays 6% annual interest compounded daily. How long will it take for the balance to reach \$1,000.

$A = P(1 + \frac{r}{n})^{nt}$

$1000 = 100(1 + \frac{0.06}{365})^{365t}$

$1000 = 100(1.0001\ldots)^{365t}$

$10 = (1.0001\ldots)^{365t}$

$\log_{1.0001\ldots} 10 = \cancel{\log_{1.0001\ldots} 1.0001\ldots}^{365t}$

$\frac{\log 10}{\log 1.0001\ldots} = 365t$

$t \approx \boxed{38.4 \text{ years}}$