Applied Algebra II
Chapter 8 Test Review

Name: KEY
Date: ____________ Block: ____

OPERATIONS WITH "e" * Treat "e" like a variable

1. $\frac{e^4}{e^3} \cdot \frac{-3}{e} = \frac{-3e^4}{e^4} = -3$

2. $(2e^x)(4e^x)(-e^{-3x}) =$
$-8e^{x+x+(-3x)} =$
$-8e^{-x} = \frac{-8}{e^x}$

3. $\frac{e^{3x} \cdot e^{2x} \cdot e^x}{e^{-x}} = \frac{e^{3x+2x+x}}{e^{-x}} =$
$\frac{e^{6x}}{e^{-x}} = e^{6x} \cdot e^x = e^{7x}$

4. $\sqrt{64e^{4x}}$
$8 \cdot 8 \quad e^x \cdot e^x \quad e^x \cdot e^x$
$8e^{2x}$

Rewrite in exponential form, then evaluate.
*You can also use "Change of Base."

*REMEMBER: $\log_a b = x$
$a^x = b$

5. $\log_2 0.5$
$2^x = 0.5$
$x = -1$
$\frac{\log(0.5)}{\log 2} = -1$

6. $\log_3 1$
$3^x = 1$
$x = 0$
$\frac{\log(1)}{\log(3)} = 0$

7. $\ln e^1$
* $\ln = \log_e$
$\log_e e^1 = 1$

8. $\log_5 3{,}125$
$5^x = 3125$
$x = 5$
$\frac{\log(3125)}{\log(5)} = 5$

9. $\log_2 32$
$2^x = 32$
$x = 5$
$\frac{\log(32)}{\log(2)} = 5$

10. $\log_2 \frac{1}{4}$
$2^x = \frac{1}{4}$
* $2^2 = 4$, so $2^{-2} = \frac{1}{4}$
$x = -2$
$\frac{\log(\frac{1}{4})}{\log(2)} = -2$

*Remember: mult. ⇔ add.
Div. ⇔ Subtract

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Expand

11. $\ln 3xy$

$\ln 3 + \ln x + \ln y$

12. $\log_3 \frac{5x}{2}$

$\log_3 5 + \log_3 x - \log_3 2$

13. $\log_2 x^2 y$

$\log_2 x^2 + \log_2 y$

$2\log_2 x + \log_2 y$

14. $\log_5 \frac{x^2}{2}$

$\log_5 x^2 - \log_5 2$

$2\log_5 x - \log_5 2$

Condense

15. $3\log x + \log 7$

$\log x^3 + \log 7$

$\log 7x^3$

16. $\log_7 b - \log_7 4$

$\log_7 \frac{b}{4}$

17. $\log_4 x + 2\log_4 y + 3\log_4 z$

$\log_4 x + \log_4 y^2 + \log_4 z^3$

$\log_4 xy^2z^3$

Find the Inverse Functions *REMEMBER: $\log_a x = b \longleftrightarrow a^b = x$

18. $y = \log_8(x-1)$ *switch x & y

$x = \log_8(y-1)$

$8^x = y-1$

$y = 8^x + 1$

19. $y = \log 2x$

$x = \log 2y$

* $\log = \log_{10}$

$x = \log_{10} 2y$

$10^x = 2y$

$y = \frac{10^x}{2}$

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*Make the bases the same in order to cancel them out.
*Then set exponents equal to each other.

Solve

20. $10^{3x+5} = 10^{x-3}$

$3x+5 = x-3$
$-x \quad -x$
$2x+5 = -3$
$-5 \quad -5$
$\frac{2x}{2} = \frac{-8}{2}$

$x=-4$

21. $10^{4x-1} = 1{,}000$

*$1000 = 10^3$

$10^{4x-1} = 10^3$
$4x-1 = 3$
$+1 \quad +1$
$\frac{4x}{4} = \frac{4}{4}$

$x=1$

22. $9^x = 27^{x+1}$

$3^2 = 9 \quad 3^3 = 27$

$3^{2(x)} = 3^{3(x+1)}$

$2x = 3x+3$
$-3x \quad -3x$
$-x = 3$

$x=-3$

23. $\log_3(2x-1) = 2$

*Remember $\log_a b = x \longleftrightarrow a^x = b$

$3^2 = 2x-1$
$9 = 2x-1$
$+1 \quad +1$
$\frac{10}{2} = \frac{2x}{2}$

$x=5$

24. $\log_5(4x+1) = \log_5(2x+7)$

*$\log_5$ cancels out

$4x+1 = 2x+7$
$-2x \quad -2x$
$2x+1 = 7$
$-1 \quad -1$
$2x = 6$

$x=3$

*25. $2\log_5 x - \log_5 2 = \log_5(2x+6)$

$\log_5 x^2 - \log_5 2 = \log_5(2x+6)$

$\log_5 \frac{x^2}{2} = \log_5(2x+6)$

$\frac{x^2}{2} = \frac{2x+6}{1}$

$x^2(1) = 2(2x+6)$
$x^2 = 4x+12$

$x^2-4x-12=0$
$(x-6)(x+2)=0$

$x=6,-2$

26. The value of a new car purchased for \$20,000 decreases by 10% per year. Write an exponential decay model for the value of the car. Use the model to estimate the value after one year.

Exponential Decay → $y = a(1-r)^t$

$a = 20{,}000$
$r = 10\% = 0.1$
$t = 1$

$y = 20{,}000(1-0.1)^1$

$y = \$18{,}000$

27. You deposit $1,000 in an account that pays 6% annual interest compounded monthly. Find the balance at the end of 2 years.

Compound Interest:

$$y = a\left(1+\frac{r}{n}\right)^{n\cdot t}$$

$a = 1000$
$r = 6\% = 0.06$
$n = 12$
$t = 2$

$$y = 1000\left(1+\frac{0.06}{12}\right)^{12\cdot 2}$$

$$y = \$1127.16$$

28. The number of computers C per 100 people worldwide can be modeled by $C = 25.2(1.15)^t$ where t is the number of years.

a. What is the initial amount of computers per 100 people worldwide?

$y = a\cdot b^x$

$a = 25.2$

b. Estimate the number of computers per 100 people worldwide in 19 years.

$t = 19$

$$C = 25.2(1.15)^t$$
$$C = 25.2(1.15)^{19}$$
$$C = 358.64$$
$$C \approx 359 \text{ Computers}$$