

Warm Up

**Finish the last questions from
WS 807 from yesterday.**

808 Unit 8 Keys

Algebraic Method:

Given an Exponential Expression:

- 1) Isolate the variable exponent as much as possible
- 2) Rewrite the expression as a logarithm
- 3) Solve

Given a Logarithmic Expression:

A. Logs on 1 side –

- 1) Condense the side to one logarithm using properties
- 2) Rewrite as an exponential
- 3) Solve

B. Logs on both sides –

- 1) Condense both sides to one logarithm
- 2) Drop the logs
- 3) Solve

Graphing Method:

- 1) Put one side of the equation into Y1
- 2) Put the other side of the equation into Y2
- 3) Graph with ZOOM Fit
- 4) 2nd Trace → #5 Intersect → Enter → Enter → Enter
- 5) x value is the solution

1. Find $\log 0.48$

$$\boxed{-0.319}$$

2. Simplify the expression $(3x^4y^5)^{-2}$

$$\boxed{\frac{y^{25}}{243x^{20}}} \quad 3^{-5} x^{-20} y^{25}$$

3. Find antilog 4.71

$$\rightarrow 10^{4.71}$$

$$\boxed{51,286.138}$$

4. Evaluate $\log_2 \frac{1}{32}$

$$\boxed{-5}$$

5. Solve $\log_5 x = -3$

$$5^{-3} = x$$

$$\boxed{x = \frac{1}{125}}$$

6. Solve $\log_{36} x = 0.5$

$$36^{0.5} = x$$

$$\boxed{x = 6}$$

7. Solve $\log_4 72 = x$

$$\boxed{x = 3.085}$$

8. Solve $\log_7(2x-9) = \log_7 11$

$$2x - 9 = 11$$

$$2x = 20$$

$$\boxed{x = 10}$$

9. Solve $2 \log_4(x) = 3$

$$\log_4 x^2 = 3$$

$$4^3 = x^2$$

$$64 = x^2 \quad \boxed{x=8}$$

10. Solve $\log_3(3) + \log_3(x-2) = \log_3 18$

$$\log_3(3x-6) = \log_3 18$$

$$3x-6=18$$

$$3x=24$$

$$\boxed{x=8}$$

11. Solve $\log_5(x+5) - \log_5 x = 2$

$$\log_5 \frac{x+5}{x} = 2$$

$$5^2 = \frac{x+5}{x}$$

$$25x = x+5$$
$$24x = 5$$

12. Solve $4e^{-3x} = 36$

$$e^{-3x} = 9$$

$$\ln 9 = -3x$$

$$\boxed{x = -0.732}$$

13. Solve $4^{3a-6} = 28$

$$\log_4 28 = 3a-6$$

Ans +6

Ans /3

$$\boxed{x = 2.801}$$

14. Solve $5^{-3x} - 8 = 6$

$$5^{-3x} = 14$$

$$\log_5 14 = -3x$$

$$\boxed{x = -0.547}$$

15. Solve $2^{4x} = 8^{x-4}$

16. Solve $3^{2t} = 5^{t+5}$

5. Solve $2^{4x} = 8^{x-4}$

$$2^{4x} = (2^3)^{x-4}$$

$$2^{4x} = 2^{3x-12}$$

$$4x = 3x - 12$$

$$\boxed{x = -12}$$

16. Solve $3^{2t} = 5^{t+5}$

$$\log_5 3^{2t} = t+5$$

$$2t \log_5 3 = t+5$$

$$2t \log_5 3 - t = 5$$

$$t(2 \log_5 3 - 1) = 5$$

$$t = \frac{5}{2 \log_5 3 - 1} = \boxed{13.691}$$

17. The future value F_n of an annuity is given by the expression

$$F_n = P \left[\frac{\left(1 + \frac{r}{n}\right)^{nt} - 1}{\left(\frac{r}{n}\right)} \right], \text{ where } P \text{ is the } n=1$$

periodic payment, r is the rate, t is time, n is the number of times compounded.

Samantha plans to save \$210 each year for 45 years, at an annual interest rate of 5.25%.

How much will she have in her account at the end of that time?

$$210 \left[\frac{(1+0.0525)^{45} - 1}{0.0525} \right]$$

$$\boxed{\$35999.51}$$

18. The Parker family plan to save amount P each year. They used the

formula $P = A \left[\frac{(i)}{(1+i)^n - 1} \right]$, where A is

the amount college tuition will cost in n years, and i is the yearly interest, to find the amount they must save for each child. In 18 years, the Parkers expect college tuition to cost \$48,000.

How much must they save each year, per child, at an interest rate of 7.25%?

$$48000 \left[\frac{0.0725}{(1+0.0725)^{18} - 1} \right]$$

$$\boxed{\$1378.25}$$

19. If Ramirez family deposits \$5000 in a saving account at 7.25% interest compounded continuously, how much will be in the account after 17 years?

$$5000e^{0.0725 \cdot 17}$$

$$\boxed{\$17,148.97}$$

20. Find the amount of time required to double an amount at 7.06% if the interest is compounded continuously.

$$Z = 1e^{0.0706t}$$

$$\ln Z = 0.0706t$$

$$\boxed{9.818 \text{ years}}$$

Unit 8: Exponentials & Logarithms

Mixed Practice

Finance
Exponential Word Problems

Exponential
Logarithmic
Equations

$$3^x = 8^{x-2}$$

$$\log_8 3^x = x-2$$

$$x \log_8 3 = x-2$$

$$x \log_8 3 - x = -2$$

$$x(\log_8 3 - 1) = -2$$

A couple other options for solving.

Now that we have taken a quiz

$$x = \frac{-2}{\log_8 3 - 1}$$

$$x = 4.240$$

Graph

1) $5^{3y} = 8$

2) $4^{x-1} = 2^x$

3) $2^{x-1} = 5^x$

4) $7^{x+2} = 13^{5-x}$

5) $9^{3x} = 3^{5x+2}$

1) $5^{3y} = 8$

$$\log_5 8 = 3x$$

$$x = 0.431$$

2)

3)

4)

5)

2) $4^{x-1} = 2^x$

$$(2^2)^{x-1} = 2^x$$

$$2^{2x-2} = 2^x$$

$$2x - 2 = x$$

$$-2 = -x$$

$$x = 2$$

3)

4)

5)

3) 2^{x-1} = 5^x

$$\log_2 5^x = x-1$$

$$x \log_2 5 = x-1$$

$$x \log_2 5 - x = -1$$

$$x(\log_2 5 - 1) = -1$$

$$x = \frac{-1}{\log_2 5 - 1}$$

$$x = -0.756$$

4)

5)

4) 7^{x+2} = 13^{5-x}

$$\log_7 13^{5-x} = x+2$$

$$(5-x) \log_7 13 = x+2$$

$$5 \log_7 13 - x \log_7 13 = x+2$$

$$-x \log_7 13 - x = 2 - 5 \log_7 13$$

$$x(-\log_7 13 - 1) = 2 - 5 \log_7 13$$

$$x = \frac{2 - 5 \log_7 13}{-\log_7 13 - 1}$$

$$x = 1.980$$

5)

$$5) \quad 9^{3x} = 3^{5x+2}$$

$$(3^2)^{3x} = 3^{5x+2}$$

$$3^{6x} = 3^{5x+2}$$

$$6x = 5x + 2$$

$$\boxed{x=2}$$

Solve.

$$d) \quad e^{4x} = 120$$

$$\log_e 120 = 4x$$

$$\ln 120 = 4x$$

$$\boxed{x=1.197}$$

$$e) \quad 6.5 = -16.25 \ln x$$

$$-0.4 = \ln x$$

$$e^{-0.4} = x$$

$$\boxed{x=0.670}$$

$$\text{antilog } 3.82 \rightarrow 10^{3.82}$$

antilog 2.21

$$\text{antiln } 4.56 \rightarrow e^{4.56}$$

antiln 7