Name:_____ Date:_____

Notes: Change of Base Formula and Solving Exponential Equations

Do Now: Solve each of the following equations.

1) $3^{2x-1} = 27^{4x-7}$

2) $125^{8x+9} = 25^{7x+16}$

3) $3^{x} = 7$

4) $4^{x-20} = 18$

What Should I Be Able to Do?

- I can use the change of base formula to evaluate any logarithm.

- I can mathematically show how to obtain the change of base formula for any logarithm.

- I can solve exponential equations without getting common bases.

Solve:

$$20(4)^{0.1x} + 2 = 18$$

Solve, rounding your answer to the nearest thousandth:

$$35e^{8x} - 11 = 25$$

Solve:

$$14^x = 29$$

(Hint: Try to do the inverse operation of an exponential to both sides of the equation)

Change of Base Formula:

$$\log_b x = \frac{\log_a x}{\log_a b}$$

If you are using common logarithms for the change of base formula:

$$\log_b x = \frac{\log x}{\log b}$$

Solve each of the following:

1) $5^x = 4$

2) $44^x = 21$

3) $e^x = 1024$

Rewrite each of the following logarithms using the Change of Base Formula, then round to the nearest thousandth.

4) $\log_2 6$

5) $\log_{\frac{1}{2}} 12$

6) $\log_{106} 23$

Solve:

$$3^{2x+9} = 4^{3x-1}$$

Solve the following exponential equations:

1) $5^{x} = 8^{3x+10}$

2) $12^{2x+11} = 7^{5x-19}$

Success Criteria

- I can use the change of base formula to evaluate any logarithm.

Rewrite each of the following logarithms using the Change of Base Formula, then round to the nearest hundredth.

1) $\log_{\frac{1}{4}} 9$ 2) $\log_3 15$ 3) $\log_{87} 31$

- I can mathematically show how to obtain the change of base formula for any logarithm.

Explain how you can solve $6^x = 19$ to prove the change of base formula.

- I can solve exponential equations without getting common bases.

1) $3^{x-1} = 2^{x+1}$ 2) $14^{3x-3} = 17^{8x-13}$

By taking the log of both sides of the equation, how does that help us solve an exponential equation?

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Classwork: Change of Base Formula and Solving Exponential Equations

Rewrite each of the following logarithms using the Change of Base Formula, then round to the nearest hundredth.

1) $\log_5 2$

2) $\log_{44.5} 18$

3) $\log_{0.3} 0.95$

Solve each of the following exponential equations.

4) $2(6)^{4x} - 17 = 65$

5) $e^{x-4} = 4^{5x-1}$

6) $6e^{3x-1} + 14 = 35$

7) $8^{2x-5} = 13^{x+1}$

8) Solve for t in the equation $A = B + Ce^{-kt}$.

9) Solve the following equation:

$$a^{1/\log a} = 8$$

Explain why your solution is true.

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