p. 36-37 Solving Log Equations Special Bases 7.5

Warm-up:

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Solve the following equation for x.

$$5^{2x} = 130$$

$$\log_5 130 = 2x$$

$$\frac{\log 130}{\log 5} = 2x$$

$$\frac{3.02}{2} = \frac{\cancel{2}x}{\cancel{2}}$$

$$1.51 = x$$

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We have discussed how to solve equations by rewriting to exponential form and to logarithmic form. We have also learned how to evaluate logs using Change of Base Formula. There are 2 special bases we need to be familiar with in order to solve equations.

The "common," or **base-10 log** $\log_{10} x$ is often written as $\log x$ If a log has no base written, assume that the base is 10.	The "natural", or **base-*e* log** $\log_e x$ is often written as $\ln x$ If you see "ln" assume that the base is e.
$\mathbf{\log_{10} 100}$ *can be written as* log 100	$\mathbf{\log_e 8}$ *can be written as* ln 8

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Examples:

1) $\log x = 5$ ← Log Form

$\log_{10} x = 5$

$10^5 = x$ Exponential Form

$\boxed{100{,}000 = x}$

2) $\log y = 2$

$\log_{10} y = 2$

$10^2 = y$

$\boxed{100 = y}$

3) $5 = e^y$

$e^y = 5$

$\boxed{\log_e} 5 = y$

$\ln 5 = y$

$\boxed{1.61 = y}$

4) $\boxed{\ln} x = 6$

$\log_e x = 6$

$e^6 = x$

$\boxed{403.43 = x}$

Algebra 2 In-class Homework **Name:**________________________

Solving Equations – Special Bases **Date:** ___________ **Period:** _____

Change of Base Formula	**LOGARITHMIC FORM**	**EXPONENTIAL FORM**
$\log_b x = \dfrac{\log x}{\log b}$	$\log_b y = x$	$b^x = y$

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$\log_{10} x$ is often written as $\log x$ If a log has no base written, assume that the base is 10.	$\log_e x$ is often written as $\ln x$ If you see "$\ln$" assume that the base is e.
$\log_{10} 100$ *can be written as* ______________	$\log_e 8$ *can be written as* ______________

Part I – Write each equation in exponential form

1.) $\log 1000 = 3$ ______________

2.) $\ln e^5 = 5$ ______________

3.) $\log_5 125 = 3$ ______________

4.) $\ln 1 = 0$ ______________

5.) $\log 0.001 = -3$ ______________

6.) $\log 10 = 1$ ______________

Part II – Write each equation in logarithmic form

7.) $3^4 = 81$ ______________

8.) $10^5 = 100,000$ ______________

9.) $e^0 = 1$ ______________

10.) $10^{-2} = 0.01$ ______________

11.) $e^1 = e$ ______________

12.) $4^3 = 64$ ______________

Part III – Mixed Practice Solving. If necessary, round to the nearest hundredths.

13.) $\log_8(x+25)=2$

14.) $12\log(2x-30)=36$

15.) $\ln(3x)=2$

16.) $-3\log_2(x-3)=-18$

17.) $\log x = 1.7$

18.) $40e^{1.25x}-200=2000$

19.) $7\ln 2x = 21$

20.) $10\log_8(4x-12)=30$

21.) $100 \bullet e^{0.2x}=300$