Key

Unit 3 Day 1 Notes: Introducing Exponents and Logarithms

Exponential Form	Logarithmic Form
$b^y = x$	$\log_b x = y$

Examples: Rewriting in Logarithmic Form:

1. $5^3 = 125$ $\log_5 125 = 3$
2. $7^2 = 49$ $\log_7 49 = 2$
3. $2^{10} = 1024$ $\log_2 1024 = 10$
4. $2^6 = 64$ $\log_2 64 = 6$

Examples: Rewriting in Exponential Form

1. $\log_{10} 1000 = 3$ $10^3 = 1000$
2. $\frac{1}{2} = \log_{16} 4$ $16^{1/2} = 4$
3. $\log_3 \frac{1}{9} = -2$ $3^{-2} = \frac{1}{9}$
4. $\log_{10} 100 = 2$ $10^2 = 100$

Examples: Solve for x.

1. $\log_2 16 = x$ 4
2. $\log_8 2 = x$ $\frac{1}{3}$
3. $\log_3 3^4 = x$ 4
4. $\log_3 81 = x$ 4
5. $\log_{49} 7 = x$ $\frac{1}{2}$
6. $\log_3 27 = x$ 3

Properties of Logarithms

$\log_b b = 1$	$\log_b 1 = 0$	If $b > 0$ and $b \neq 1$
$b^1 = b$	$b^0 = 1$	a) $\log_b b^x = x$ b) $b^{\log_b x} = x$

Examples: Solve for x by using properties of Logarithms.

1. $\log_7 7 = x$ 1
2. $\log_5 1 = x$ 0
3. $\log_4 4^5 = x$ 5
4. $3^{\log_3 17} = x$ 17
5. $\log_8 1 =$ 0
6. $\log_5 5^{12} =$ 12
7. $\log_{19} 19 =$ 1
8. $6^{\log_6 7} = x$ 7

$2x = \frac{1}{2}$
$x = \frac{1}{4}$

Natural Logarithms

- Log with base *e*
- Denoted **ln**
- Have same properties as regular logarithms. (Using *e* instead of numerical bases).

$\ln 1 = 0$ $e^0 = 1$

$\ln e = 1$ $e^1 = e$

$\ln e^x = x$ $e^x = e^x$

$e^{\ln x} = x$

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$\log_9 \sqrt{3} = x$

$9^x = \sqrt{3}$

$9^x = 3^{1/2}$

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

CW #1:

1. $10^{-1} = 0.1$
2. $8^{3} = 512$
3. $3^{4} = 81$
4. $8^{2/3} = 4$
5. $e^{2} = x+1$
6. $e^{4} = x-1$

1. $\log_{10} 10000 = 4$
2. $\log_{81} 9 = \frac{1}{2}$
3. $\log_{8} \frac{1}{8} = -1$
4. $\log_{10} n = m$
5. $\ln_e 0.5 = x+1$
6. $\ln_e t = 0.5x$

1. 1	2. 0	3. 2	4. 5
5. 17	6. 0	7. 3	8. $\frac{1}{2}$
9. $\frac{1}{2}$	10. π	11. 5	12. 87
13. $\frac{1}{4}$	14. $-\frac{1}{2}$	15. $\frac{3}{2}$	

1. 32	2. -1	3. 10	4. 5
5. 36	6. 27		