

# Review

Logarithmic Form

$$\log_b Y = X$$

↑  
base

↙  
exponent

Exponential Form

$$b^X = Y$$

↑  
base

↖  
exponent

Rewrite into Exponential Form

#1)  $\log_b X = 4$

$$b^4 = X$$

#2)  $\log 100 = X$

$$10^X = 100$$

{ Alpha window #5 }

Rewrite into Logarithmic Form

#3)  $5^X = 625$

$$\log_5 625 = X$$

$$X = 4$$

#4)  $7^3 = m$

$$\log_7 m = 3$$

# Unit 2 Day 2: Properties of Logs and Solving using Properties

Natural logarithm: has a base of e, ( $\log_e y$ ) but we write ln  $\leftarrow e$   $\log$   $\leftarrow 10$

All properties that apply to logarithms also apply to the natural log!

## Properties of Logarithms (Expanding and Condensing)

1.  $\log_a m + \log_a n = \log_a (m \cdot n)$  addition  $\Rightarrow$  multiplication
2.  $\log_a m - \log_a n = \log_a \left(\frac{m}{n}\right)$  subtraction  $\Rightarrow$  division
3.  $\log_a (m^n) = n \log_a (m)$  power on inside  $\Rightarrow$  multiplier on outside

## Ex. Condense Each Logarithm

1.  $\ln x^7 = \ln x^7$

2.  $\log(x) + \log(x-2) = \log(x(x-2)) = \log(x^2 - 2x)$

3.  $\log 4x^3 - \log 2x =$  order matters  
 $\log\left(\frac{4x^3}{2x}\right) = \log(2x^2)$

4.  $\ln(x+5) - \ln x = \ln\left(\frac{x+5}{x}\right)$

## Solving Using Properties

Solve the following. You may have to use some condensing properties!

1.  $\ln(3x-5) = 4$  ① Convert to exponential form  
 $e^4 = 3x-5$  ② Solve for X  
 $54.60 = 3x-5$   $\frac{59.60}{3} = \frac{3x}{3}$   
 $+5$   $x = 19.87$

2.  $\log_6(4x+2) + \log_6 2 = 2$   
 $\log_6((4x+2)2) = 2$   $36 = 8x+4$   
 $\log_6(8x+4) = 2$   $-4$   $-4$   
 $6^2 = 8x+4$   $\frac{32}{8} = \frac{8x}{8}$   
 $x = 4$

3.  $\log_2(8x^3) - \log_2(2x) = 6$   
 $\log_2\left(\frac{8x^3}{2x}\right) = 6$   $\frac{64}{4} = \frac{4x^2}{4}$   
 $\log_2(4x^2) = 6$   $\pm\sqrt{16} = \sqrt{x^2}$   
 $2^6 = 4x^2$   $x = \pm 4$

4.  $\log_3(2x+1) + \log_3 3 = 4$   
 $\log_3((2x+1)3) = 4$   $78 = 6x$   
 $\log_3(6x+3) = 4$   $\frac{78}{6} = \frac{6x}{6}$   
 $3^4 = 6x+3$   $x = 13$   
 $81 = 6x+3$

5.  $\log_2(x+6) - \log_2 x = 2$

6.  $\ln_2(4x-1) = 3$   
 $e^3 = 4x-1$   $\frac{21.09}{4} = \frac{4x}{4}$   
 $20.09 = 4x-1$   $+1$   $+1$   
 $+1$   $x = 5.27$