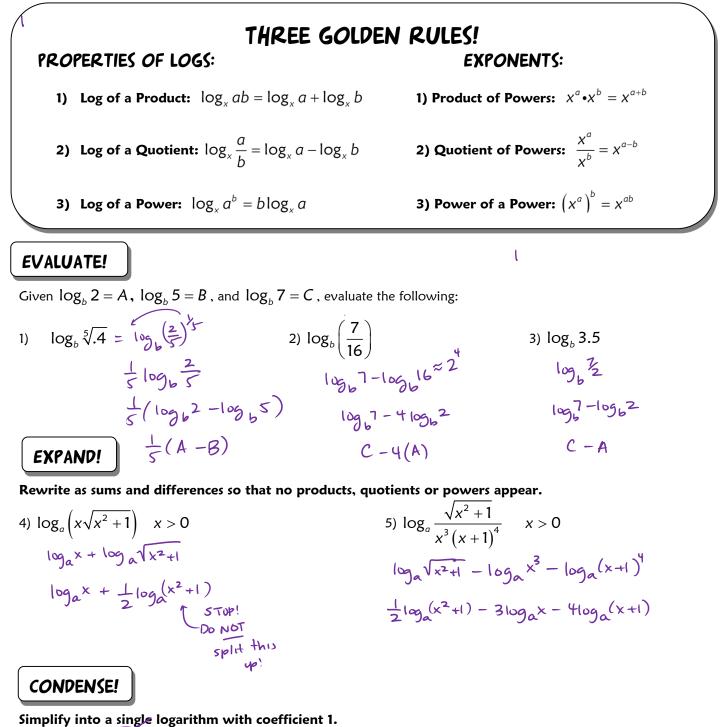
5.4 Notes

## PROPERTIES OF LOGARITHMS

Objectives: 1) Condense and expand expressions using log properties

- 2) Find an x intercept using log properties
- 3) Use a logarithm to solve an equation
- 4) Use change of base to simplify expressions



6) 
$$\log_{a} 7 + 4\log_{a} 3$$
  
 $1 \frac{1}{3} \left[ \log_{2} x + \log_{2} (x+1) \right]$   
 $\frac{1}{3} \left[ \log_{2} x + \log_{2} (x+1) \right]$   
 $\frac{1}{3} \left[ \log_{2} (x(x+1)) \right]$   
 $\log_{a} x + \log_{a} 9 + \log_{a} (x^{2}+1) - \log_{a} 5 + \log_{a} (x^{2}+1) - \log_{a} 5 + \log_{a} (x^{2}+1) \right]$ 

YOU TRY

Expand:

9) 
$$\log_{3} \frac{x^{2}y}{\sqrt[5]{3x-1}}$$
 10)  $\log_{4} 5x^{3}y$  11)  $\log_{7} h^{2} j^{11} k^{-5}$  12)  $\ln \frac{\sqrt{3x-5}}{7}$   
 $2\log_{3}x + \log_{3}y - \frac{1}{5}\log_{3}(3x-1)$   
 $\log_{4}5 + 3\log_{4}x + \log_{4}y$   
 $\frac{1}{5}\ln(3x-5) - \ln 7$ 

Condense:

 $4^{x} = 32$ 

 $(2^{2})^{k} = 2^{5}$ 

13) 
$$\frac{1}{2}\log x + 3\log(x+1)$$
  
 $\log(\sqrt{x} \cdot (x+1)^3)$ 
14)  $2\ln(x+2) - \ln x$   
 $\ln \frac{(x+2)^2}{x}$ 

15) 
$$2[\log_3 x + 3\log_3 (x-2)]$$
  
 $2(\log_3 x \cdot (x-2)^3)$   
 $2\log_3 (x(x-2)^3)$   
 $\log_3 (x(x-2)^3)$   
 $\log_3 (x(x-2)^3)$ 

USING LOGS TO SOLVE EXPONENTIAL EQUATIONS

Sometimes, when solving an exponential equation, we must use logs. There are two types of exponential equations -

those that can be written with the same base, and those that cannot. **SAME BASE VS. NOT SAME BASE** 

 $4^{x} = 31$ 

Whenever you get "stuck" in an exponential or log equation, rewrite it as its opposite! **YOU CAN SOLVE IT IN ONE OF TWO WAYS**.

