

5.5 & 5.6

## Develop Log & Rules of Logs

$$\boxed{\log_b x = a \iff b^a = x}$$

Defined as the exponent you get when you write  $x$  as the power of base  $b$

Restriction  $b > 0, b \neq 1 \therefore x > 0$

Ex  $\log_7 49 \rightarrow 2$

NO  
CALC

$\log_2 \frac{1}{8} \rightarrow -3$

$\log_3 \sqrt[5]{1/9} \rightarrow$

$3^x = (\frac{1}{9})^{\frac{1}{5}} \Rightarrow 3^x = (3^{-2})^{\frac{1}{5}} = -2/5$

Common Log

Base 10

$\log x = a \iff 10^a = x$  Ex  $\log x = 2$

Natural Log

Base  $e$

$\ln 5 \iff e^x = 5$

$10^2 = x$   
 $[x = 100]$

Ex  $\ln 5 \iff e^x = 5$

Change of Base Property

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

Ex  $\log_{12} 137 \iff 12^x = 137 \iff \frac{\log 137}{\log 12}$

LAWS OF LOGS :  $M, N$  are real #'s

$\log_b MN = \log_b M + \log_b N$

$\log_b \frac{M}{N} = \log_b M - \log_b N$

$\log_b m^k = k \cdot \log_b m$

III) Inverses Compare Graphs

$y = \log x$

$y = 10^x$

$y = \log_2 x$

$y = 2^x$

$\log_3 (x-2) + 1$

I) Ex Simplify

a)  $\log 45 - 2 \log 3$

b)  $2[\log x - \frac{1}{2} \log y + 3 \log y]$

Expand

c)  $\log(2x^2 + 3x + 1)$

d)  $3 \cdot \log(\frac{5xy^2}{mn})$

II) Solve Eqs

a)  $\log x = 2$

b)  $\log_x \frac{1}{2} = 1$

c)  $\ln x = -3$

c2)  $x = 10^{3 \log 2} \rightarrow$

d)  $\log_2 x + \log_2 (x-2) = 3 \rightarrow$  Extraneous

e)  $\ln y = \frac{1}{3} \ln x + \ln 4$

f) Express  $y$  in terms of  $x$   $\ln y = 1.2x - 1$

$y = e^{1.2x-1} \rightarrow y = e^{1.2x} \cdot e^{-1}$   
 $y = (\frac{1}{e}) e^{1.2x}$

HW p. 194 # 4, 6, 7, 13(c,d), 14, 16(c,d), 33-35, 37, 40, 42, 43, 45, 47, 49

p. 200 # 9, 15, 17, 21, 27, 29, 31, 33