

Section 1.4 Logarithmic Functions

COMMON LOG

$\log_{10} x = c$ means $10^c = x$
on calculator it's the log button

ex: $\log 1000 = 3$
since $10^3 = 1000$

NATURAL LOG

$\ln x = c$ means $e^c = x$
on calculator it's the ln button

$\ln x$ means $\log_e x$

$\log x$ means $\log_{10} x$

PROPERTIES OF LOGS

1) $\log_a (AB) = \log_a A + \log_a B$

2) $\log_a \left(\frac{A}{B}\right) = \log_a A - \log_a B$

3) $\log_a A^p = p \log_a A$

4) $\log_a a^x = x$ $\ln e^x = x$

5) $a^{\log_a x} = x$

6) $\log_a 1 = 0$

ex: $\log_3 81 = x$
 $3^x = 81$

ex: Simplify $2 \ln(e^A) + 3 \ln(B^e)$
 $2A + 3e \ln B$

ex: $17^x = 2$

$\ln 17^x = \ln 2$

on calculator $\ln(2)/\ln(17)$

$x \ln 17 = \ln 2$

$x = \frac{\ln 2}{\ln 17} \approx 0.245$

ex: $2^x = e^{x+1}$

$\ln 2^x = \ln e^{x+1}$

$x \ln 2 = x+1$

$0.693x - 1x = 1$

$-0.307x = 1$

$x = \frac{1}{-0.307}$

$x \approx -3.257$

ex: $10^{x+3} = 5e^{7-x}$

$\log 10^{x+3} = \log 5e^{7-x}$

$x+3 = \log 5 + \log e^{7-x}$

$x+3 = \log 5 + (7-x) \log e$

$x+3 = 0.699 + (7-x)0.434$

$1x+3 = 0.699 + 3.038 - 0.434x$

$1.434x = 0.737$

$x = 0.514$

p27-28 5, 9, 11, 29, 37, 41