MATH 12

Sec. 4.3 - 4.4 - SUMMARY

DEF $\boxed{\log_b x = t \text{ iff } b^t = x}$ for $x > 0$

IDENTITIES

1) $\boxed{\log_b b^t = t}$

2) $\boxed{b^{\log_b x} = x}$ for $x > 0$

Taking $b = e$ gives

1) $\boxed{\ln e^t = t}$

2) $\boxed{e^{\ln x} = x}$ for $x > 0$

REMARK $\log_b x$ is only defined for $x > 0$, so in particular

$\boxed{\log_b 0 \text{ is undefined}}$.

LAWS OF LOGARITHMS

1) $\log_b(xy) = \log_b x + \log_b y$

2) $\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$

3) $\log_b(x^r) = r\log_b x$

WARNING

Do not try to simplify $\log_b(x+y)$ or $(\log_b x)^r$.

CHANGE OF BASE FORMULA

$\boxed{\log_b x = \frac{\ln x}{\ln b}}$ for $x > 0$

More generally, if $a > 0$ with $a \neq 1$, then

$\boxed{\log_b x = \frac{\log_a x}{\log_a b}}$ for $x > 0$
