

PRODUCT RULE: $\text{LOG}_a(MN) = \text{LOG}_a M + \text{LOG}_a N$

EXAMPLES:

$$\text{LN}(7X) =$$

$$\text{LOG}_4(7 \cdot 5) =$$

$$\text{LOG}(10X) =$$

QUOTIENT RULE: $\text{LOG}_a\left(\frac{M}{N}\right) = \text{LOG}_a M - \text{LOG}_a N$

EXAMPLES:

$$\text{LOG}_7\left(\frac{19}{X}\right) =$$

$$\text{LOG}\left(\frac{X}{35}\right) =$$

$$\text{LN}\left(\frac{e^3}{7}\right) =$$

POWER RULE: $\text{LOG}_a M^b = b \text{LOG}_a M$

EXAMPLES:

$$\text{LN } X^2 =$$

$$\text{LOG}_5 7^4 =$$

$$\text{LN } \sqrt{X} =$$

$$\text{LOG} (4X)^5 =$$

EXPAND / CONDENSE:

$$\text{LOG}_b (X^2 \sqrt{Y}) =$$

$$\text{LOG}_6 \left(\frac{\sqrt[3]{X}}{36Y^4} \right) =$$

$$\text{LOG}_4 2 + \text{LOG}_4 32 =$$

$$\text{LOG} (4X-3) - \text{LOG } X =$$

$$\frac{1}{2} \text{LOG} X + 4 \text{LOG}(X-1) =$$

$$3 \text{LN}(X+7) - \text{LN} X =$$

$$4 \text{LOG}_b X - 2 \text{LOG}_b 6 - \frac{1}{2} \text{LOG}_b Y =$$

CHANGE OF BASE RULE:

$$3^x = 18$$

$$\text{LOG}_a M = \frac{\text{LOG}_b M}{\text{LOG}_b a} = \frac{\text{LOG } M}{\text{LOG } a} = \frac{\text{LN } M}{\text{LN } a}$$

SOLVE.

$$\text{LOG}_5 140$$

$$\text{LOG}_6 48$$

$$5^x = 72$$

$$12^x = 435$$