$y = \log x \longleftrightarrow 10^y = x$

swapped inputs and outputs.

$y = \ln x \longleftrightarrow e^y = x$

$y = \log_2 x \longleftrightarrow 2^y = x$

1] $\log(AB) = \log A + \log B$

$A, B > 0$

let $A = 10^x$, $B = 10^y \rightarrow x = \log A$, $y = \log B$

$\log(AB) = \log(10^x \cdot 10^y) = \log(10^{x+y})$

$= x + y = \log A + \log B$

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

$\log\left(\frac{10^x}{10^y}\right) = \log\left(10^{x-y}\right) = x - y$

$= \log A - \log B$ ☒

aside: $\log 10^9 = 9$ || $\log_2 2^9 = 9$

$10^{\log S} = S$ || $2^{\log_2 S} = S$

$\ln e^t = t$ || $e^{\ln t} = t$

3] $\log(A^t) = t \log A$

let $A = 10^x \longleftrightarrow x = \log A$

$A^t = 10^{tx}$

$\log(A^t) = \log(10^{tx})$

$\log(A^t) = tx$

** $\boxed{\log(A^t) = t \log A}$

$$2^x = 10$$

$$\ln 2^x = \ln 10$$

$$x \ln 2 = \ln 10$$

$$x = \frac{\ln 10}{\ln 2} = 3.32$$

Ex

$$10^x = 33$$

$$\log 10^x = \log 33$$

$$x = \log 33 \approx 1.518$$

Ex

$$2^x = x$$

$$\log 2^x = \log x$$

$$x \log 2 = \log x$$

$$x \log 2 \quad \log x$$

$$10 \qquad = 10$$

$$2^x = x$$

C-14 half life 5700 years

$$A(t) = A_0\left(\frac{1}{2}\right)^{t/5700}$$

20% of C^{14} has decayed. How much time has elapsed.

$$0.80 = 1\left(\frac{1}{2}\right)^{t/5700}$$

$$\log(.80) = \log\left(\frac{1}{2}\right)^{t/5700}$$

$$\log(0.80) = \frac{t}{5700}\log\left(\frac{1}{2}\right)$$

$$1834 \approx \frac{5700\log(0.80)}{\log\left(\frac{1}{2}\right)} = t$$

years

ex Expand $\log(1000x^3) = \log 1000 + \log x^3$

$= 3 + 3\log x$

$= 3(1 + \log x)$

Condense

$3\log x - 2\log y + 10\log z$

$= \log x^3 - \log y^2 + \log z^{10}$

$= \log\left(\frac{x^3}{y^2}\right) + \log z^{10}$

$= \log\left(\frac{x^3 z^{10}}{y^2}\right)$

$\frac{1}{2}\log y = \log y^{1/2} = \log\sqrt{y}$