Ex $\log_2(256) = \log_2(2^8) = 8$

Ex $\log_{\sqrt{2}}(8) = \log_{\sqrt{2}}(2^3) = \log_{\sqrt{2}}\left(2^{\frac{1}{2}}\right)^6$

$= 6$

Ex $e^{x\ln 5} = e^{\ln 5^x} = 5^x$

$\boxed{e^{\ln x} = x} \longleftrightarrow \boxed{\ln e^x = x}$

Ex $4^x - 8\cdot 2^x + 12 = 0$

solve for x

$2^{2x} - 8\cdot 2^x + 12 = 0$

let $u = 2^x$

$u^2 - 8u + 12 = 0$

$(u-6)(u-2) = 0$

$u = 6, 2$

$6 = 2^x$

$2 = 2^x \rightarrow \boxed{x=1}$

m

$\ln 6 = x \ln 2$

..

$\boxed{\frac{\ln 6}{\ln 2} = x}$

Applications

U^{235} half life 7 MM years

start w/ 100 g.

$$A(t) = 100\left(\frac{1}{2}\right)^{t/7}$$

$$A(t) = 100\,e^{kt}$$

$$A(t) = 100\,e^{-0.09902t}$$

$$e^{k} = \left(\frac{1}{2}\right)^{1/7}$$

$$k = \frac{1}{7}\ln\left(\frac{1}{2}\right)$$

$$k = -0.09902$$

Newton's Law of Cooling

all exponentials $y = Ae^{kt}$

$P(t) = P_1 e$ $400°$

T_R = Room Temp $70°$

$$P(t) - T_R = Ae^{kt}$$

$$P(t) - 70 = Ae^{kt}$$

$t=0$ $P(0) = 400$ $400 - 70 = A(1)$

note: $A = (P(0) - T_R)$

$$P(t) - 70 = (400-70)e^{kt}$$

$P(60) = 100$

$$100 - 70 = 330e^{60k}$$

$$\frac{30}{330} = e^{60k}$$

$$\frac{1}{11} = e^{60k} \longrightarrow \ln\frac{1}{11} = 60k$$

$$\frac{\ln(1/11)}{60} = k$$