Applications of Logarithms

Mario's Great grandpa Sedley left a box buried in your backyard containing $25,000. If you invest it at 4% compounded monthly, will you be a millionaire in your lifetime?

Logs – used to solve for exponents.

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

$$\frac{1{,}000{,}000}{25{,}000} = \frac{25000\left(1+\frac{0.04}{12}\right)^{12t}}{25{,}000}$$

1) Divide the initial amt to other side

$$40 = (1.0033)^{12t}$$

$$\log 40 = \log 1.0033^{12t}$$

$$\frac{\log 40}{12\log(1.0033)} = \frac{12t\cdot\log(1.0033)}{12\cdot\log(1.0033)}$$

$$93.3 = t$$

93.3 yrs.

CAR - $19,500 15% depreciation
Trade it in when value of $10,000.
How many years will you drive the car?

$$N = N_0(1-r)^t$$

$$\frac{10{,}000}{19500} = \frac{19{,}500(1-0.15)^t}{19500}$$

$$\frac{20}{39} = (0.85)^t$$

$$\frac{\log\left(\frac{20}{39}\right)}{\log(0.85)} = \frac{t \cdot \log(0.85)}{\log(0.85)}$$

$$4.1 \text{ yrs} = t$$

Carbon-14, a radioactive isotope, is used to find the age of fossils. A piece of parchment from an ancient scroll is found to have 62.5% of its Carbon-14 left. How old is the scroll? The constant of decay of Carbon-14 is -0.000121.

$$q = q_0 \cdot e^{kt}$$

$$0.625 = 1 \cdot e^{-0.000121t}$$

$$0.625 = e^{-0.000121t}$$

$$\ln(0.625) = \ln e^{-0.000121t}$$

$$\frac{\ln(0.625)}{-0.000121} = \frac{-0.000121t}{-0.000121}$$

$$3884 = t$$

$$\approx 3880 \text{ yrs.}$$

Carbon-14
5700 yrs

5700 [100 g
[50

5700 [25
[12.5

Exponential Regression

$y = a \cdot b^x$

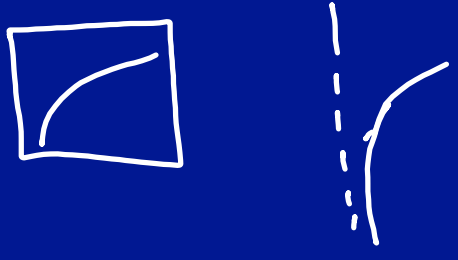
Power Regression

$y = a x^b$

~~Logistic~~

Logarithmic Regression

$y = a \ln b$



How tall will the tree be in 20 yrs.

Know → Use Table

age x	height y
20	

30 ft

When will it be 30 ft tall.