

Notes – Transforming Relationships

A function is called **monotone increasing** if

$$a > b \Rightarrow f(a) > f(b)$$

A function is called **monotone decreasing** if

$$a > b \Rightarrow f(a) < f(b)$$

Log Rules. (It does. It's awesome.)

Definition: $\log_b x = y \Leftrightarrow b^y = x$

Rule 1: $\log(AB) = \log A + \log B$

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

Rule 3: $\log(X^p) = p \log X$

In order to straighten out curved data we can use power transformations. By replacing y with y to some power or replacing x with x to some power, we can straighten data of the form $y = ax^b$.

However, we may not know the relationship of the data, so how do we know which power to use?

If we suspect that the y-values of the data are proportional to a power of the x-values, then the equation has the form $y = ax^b$:

$$\log y = \log(ax^b)$$

$$\log y = \log[(a)(x^b)]$$

$$\log y = \log a + \log x^b$$

$$\log y = \log a + b \log x$$

This is linear!

So, if there is a power relationship between y and x, there will be a linear relationship between $\log y$ and $\log x$.