

Exponential and Logarithmic Functions

☺ Exponential Function $y = b^x$ (for $0 < b \neq 1$ fixed number)



for $b > 1$

$$y = b^x$$

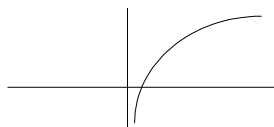
for $b < 1$



Equality of exponents: $b^x = b^z$ is equivalent to $x = z$

☺ Logarithmic Functions $y = \log_b x$ (for $0 < b \neq 1$ fixed number):

$$y = \log_b x \text{ means } b^y = x$$



$y = \log_b x$ for $b > 1$

Equality of logs: $\log_b x = \log_b z$ is equivalent to $x = z$

$$\ln x = \log_e x \quad \text{where } e \approx 2.7, \quad \log x = \log_{10} x, \quad \log_b 1 = 0, \quad \log_b b = 1$$

The three rules of log:

Product Rule: $\log_b xy = \log_b x + \log_b y$

Quotient Rule: $\log_b \frac{x}{y} = \log_b x - \log_b y$

Power Rule: $\log_b x^r = r \log_b x$

Cancellations:

$$\log_b b^x = x \quad \text{and} \quad b^{\log_b x} = x$$

Memory peg: $\log_b b^{\text{CAT}} = \text{CAT}$ and $b^{\log_b \text{DOG}} = \text{DOG}$