

- **Exponents and Logarithms**

- "e"

- **Summation**

- **Modulo Operator**

- **Symmetry**

- **Polar Coordinates**

- **Exponents and Logarithms**

- properties of power notation

$$A^3 \triangleq A \times A \times A$$

$$(A^a)^b = A^{ab}$$

$$A^a A^b = A^{a+b}$$

$$A^n \triangleq \underbrace{A \times A \times \cdots \times A \times A}_{n \text{ terms}}$$

$$A^a + A^b = A^a (1 + A^{b-a})$$

- properties of logarithmic notation

$$\log a^b = b \log a$$

$$\log ab = \log a + \log b$$

$$\log \frac{a}{b} = \log a - \log b$$

$$\log_a b = \frac{\log_c b}{\log_c a}$$

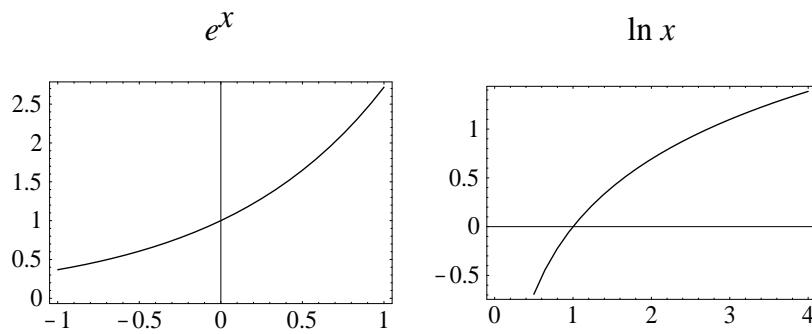
- "e"

$$e \triangleq \lim_{n \rightarrow \infty} (1+1/n)^n = \sum_{n=0}^{\infty} 1/n! \approx 2.718281828459045$$

The natural logarithm is the inverse function of e^x :

$$\ln a \triangleq \log_e a$$

$$\ln e = 1$$



- Summation

$$\sum_{n=1}^5 n^2 = 1^2 + 2^2 + 3^2 + 4^2 + 5^2 = 55$$

summations can be transposed, if summation is finite or absolutely convergent, and independent parts can "pass through" a summation:

$$\sum_n \sum_m x_n y_m = \sum_n x_n \sum_m y_m = \sum_m y_m \sum_n x_n = \sum_m \sum_n x_n y_m$$

a useful closed form:

$$\sum_{n=0}^{N-1} z^n = \frac{1 - z^N}{1 - z}$$

derivation: $\sum_{n=0}^{N-1} A = 1 + z + z^2 + \dots + z^{N-1}$
 $zA = z + z^2 + \dots + z^{N-1} + z^N$

Now subtract above equations:

$$A - zA = 1 - z^N$$

$$A = \frac{1 - z^N}{1 - z}$$

- **Modulo Operator**

- **Symmetry**

even and odd parts of functions and vectors.

- **Polar Coordinates**