Preuves mathématiques (ironiques)

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Preuve de l'homogénéité du $\sin(x)$

Théorème

$-\sin(x) = \sin(-x)$

Proof of equivalence of addition to multiplication in the definition of the factorial

Theorem

$$n! = \prod_{i=0}^{n-1}(n-i) \Leftrightarrow \sum_{i=0}^{n-1}(n-i)$$

Proof

1. It is known that :

$$n! = \prod_{i=0}^{n-1}(n-i) = (n-0) \times (n-1) \times \cdots \times 1$$

2. We apply the **rotation property** of multiplication

$$\begin{aligned} n! = \prod_{i=0}^{n-1}(n-i) &= (n-0) \times (n-1) \times \; \dots \; \times 1 \\ &= (n-0) \overset{\curvearrowright}{+} (n-1) \overset{\curvearrowright}{+} \; \dots \; \overset{\curvearrowright}{+} 1 \\ &= (n-0) + (n-1) + \; \dots \; + 1 \\ &= \sum_{i=0}^{n-1}(n-i) \end{aligned}$$

$\therefore \; n! = \sum_{i=0}^{n-1}(n-i)$

Examples of application

$$3! = \prod_{i=0}^{3-1}(3-i) = 3 \times 2 \times 1 = 6 \qquad 1! = \prod_{i=0}^{1-1} = 1$$

$$\Leftrightarrow \sum_{i=0}^{3-1} = 3+2+1 = 6 \qquad \Leftrightarrow \sum_{i=0}^{1-1}(1-i) = 1$$

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