Math Notes

Canine-Table

Github

POSIX Nexus serves as a comprehensive cross-language reference hub that explores the implementation and behavior of POSIX-compliant functionality across a diverse set of programming environments. Built atop the foundational IEEE Portable Operating System Interface (POSIX) standards, this project emphasizes compatibility, portability, and interoperability between operating systems.

Abstract

Contents

I Linear Equations **II**

II Definitions **IX**

II Pairs IX

I Linear Equations

$x + 4 = 7$

$$\begin{aligned} x + 4 &= 7 \\ x + 4 - 4 &= 7 - 4 \\ x + 0 &= 3 \end{aligned}$$

$x + 9 = 15$

$$\begin{aligned} x + 9 &= 15 \\ x + 9 - 9 &= 15 - 9 \\ x + 0 &= 6 \end{aligned}$$

$x + 9 = 15$

$$\begin{aligned} 6 + x &= 13 \\ 6 + x - 6 &= 15 - 9 \\ 0 + x - 0 &= 7 \end{aligned}$$

$x - 3 = 9$

$$
\begin{aligned}
x - 3 &= 9 \\
x - 3 + 3 &= 9 - 3 \\
x - 0 &= 6 \\
x &= 6
\end{aligned}
$$

$x + 8 = 7$

$$
\begin{aligned}
x - 8 &= 7 \\
x + 8 - 8 &= 7 + 8 \\
x - 0 &= 15 \\
x &= 15
\end{aligned}
$$

$6.3 = -2 + x$

$$\begin{aligned} 6.3 &= -2 + x \\ 6.3 + 2 &= -2 + 2 + x \\ 6.3 &= 0 + x \\ x &= 6.3 \end{aligned}$$

$5 = x - 8$

$$\begin{aligned} 5 &= x - 8 \\ 5 + 8 &= x - 8 + 8 \\ 13 &= x - 0 \\ x &= 13 \end{aligned}$$

$5 - x = 12$

$$
\begin{aligned}
5 - x &= 12 \\
5 - 12 - x + x &= 12 - 12 + x \\
-7 &= 0 + x \\
x &= -7
\end{aligned}
$$

$-8 = 5 - x$

$$
\begin{aligned}
-8 &= 5 - x \\
-8 + 8 &= 5 + 8 - x \\
0 + x &= 13 - x + x \\
x &= 13
\end{aligned}
$$

$3x = 12$

$$
\begin{aligned}
3x &= 12 \\
\frac{3x}{3} &= \frac{12}{3} \\
\frac{x}{1} &= 4 \\
x &= 4
\end{aligned}
$$

$7x = 14$

$$
\begin{aligned}
7x &= 14 \\
\frac{7x}{7} &= \frac{12}{7} \\
\frac{x}{1} &= 2 \\
x &= 2
\end{aligned}
$$

$-6x = -30$

$$
\begin{aligned}
-6x &= -30 \\
\frac{-6x}{-6} &= \frac{-30}{-6} \\
\frac{-x}{-1} &= 5 \\
x &= 5
\end{aligned}
$$

$-6x = -30$

$$
\begin{aligned}
-8x &= 48 \\
\frac{-8x}{-8} &= \frac{48}{-8} \\
\frac{-x}{-1} &= -6 \\
x &= -6
\end{aligned}
$$

$7x = -56$

$$
\begin{aligned}
7x &= -56 \\
\frac{7x}{7} &= \frac{-56}{7} \\
\frac{x}{1} &= -8 \\
x &= -8
\end{aligned}
$$

$-8x = -72$

$$
\begin{aligned}
-8x &= -72 \\
\frac{-8x}{-8} &= \frac{-72}{-8} \\
\frac{x}{1} &= 9 \\
x &= 9
\end{aligned}
$$

II Definitions

II Pairs

Factorial (n!)

Concept	Factorial ($n!$)
Definition	The product of all positive integers up to n. Defined as $n! = n \times (n-1) \times \ldots \times 1$.
Core Idea	Factorial counts permutations and combinations — it grows extremely fast.
Example	$5! = 120$.
Applications	Used in combinatorics, probability, and series expansions.
Pair	Inverse gamma function (not elementary).

Logarithm Base 2 ($\log_2$)

Concept	Logarithm Base 2 ($\log_2(x)$)
Definition	The inverse of the power of 2. Defined as the exponent y such that $2^y = x$.
Core Idea	$\log_2(x)$ measures how many times you multiply 2 to reach x.
Example	$\log_2(8) = 3$.
Applications	Widely used in computer science, information theory, and binary systems.
Pair	Power of 2 function (2^x).

Natural Logarithm ($\ln$)

Concept	Natural Logarithm ($\ln(x)$)
Definition	The inverse of the exponential function. Defined as the power to which e must be raised to equal x.
Core Idea	$\ln(x)$ undoes exponentiation with base e.
Example	$\ln(e^3) = 3$.
Applications	Used in calculus, growth/decay models, and solving exponential equations.
Pair	Exponential function (e^x).

Logarithm Base 2 ($\log_2$)

Concept	Logarithm Base 2 ($\log_2(x)$)
Definition	The inverse of the power of 2. Defined as the exponent y such that $2^y = x$.
Core Idea	$\log_2(x)$ measures how many times you multiply 2 to reach x.
Example	$\log_2(8) = 3$.
Applications	Widely used in computer science, information theory, and binary systems.
Pair	Power of 2 function (2^x).

Natural Logarithm ($\ln$)

Concept	Natural Logarithm ($\ln(x)$)
Definition	The inverse of the exponential function. Defined as the power to which e must be raised to equal x.
Core Idea	$\ln(x)$ undoes exponentiation with base e.
Example	$\ln(e^3) = 3$.
Applications	Used in calculus, growth/decay models, and solving exponential equations.
Pair	Exponential function (e^x).

Tangent and Cotangent

Concept	Tangent ($\tan(x)$) and Cotangent ($\cot(x)$)
Definition	$\tan(x) = \frac{\sin(x)}{\cos(x)}$, while $\cot(x) = \frac{\cos(x)}{\sin(x)}$. They are reciprocals: $\cot(x) = \frac{1}{\tan(x)}$.
Core Idea	Tangent measures slope (rise/run). Cotangent flips that slope (run/rise).
Example	At $45°$, $\tan(45°) = 1$ and $\cot(45°) = 1$.
Applications	Used in trigonometry, calculus, and geometry — especially for slope and angle analysis.
Pair	Reciprocal functions: $\tan(x) \leftrightarrow \cot(x)$.

Factorial (n!)

Concept	Factorial ($n!$)
Definition	The product of all positive integers up to n. Defined as $n! = n \times (n-1) \times \ldots \times 1$.
Core Idea	Factorial counts permutations and combinations — it grows extremely fast.
Example	$5! = 120$.
Applications	Used in combinatorics, probability, and series expansions.
Pair	Inverse gamma function (not elementary).

Factorial (n!)

Concept	Factorial ($n!$)
Definition	The product of all positive integers up to n. Defined as $n! = n \times (n-1) \times \ldots \times 1$.
Core Idea	Factorial counts permutations and combinations — it grows extremely fast.
Example	$5! = 120$.
Applications	Used in combinatorics, probability, and series expansions.
Pair	Inverse gamma function (not elementary).