

Math structures

Matrices

$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}, \quad \det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc, \quad A^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

$$R_z(\theta) = \begin{bmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix}$$

A small matrix inline, $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, keeps the line height.

Piecewise definitions

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{otherwise} \end{cases} \quad f(n) = \begin{cases} n/2 & n \equiv 0 \pmod{2} \\ 3n+1 & n \equiv 1 \pmod{2} \end{cases}$$

$$\operatorname{sgn}(x) = \begin{cases} \frac{x}{|x|} & x \neq 0 \\ 0 & x = 0 \end{cases}$$

Aligned derivations

$$\begin{aligned} (x+y)^3 &= (x+y)(x+y)^2 \\ &= (x+y)(x^2+2xy+y^2) \\ &= x^3+3x^2y+3xy^2+y^3 \end{aligned}$$

$$\begin{aligned} \int_0^\pi \sin^2 x \, dx &= \int_0^\pi \frac{1 - \cos 2x}{2} \, dx \\ &= \frac{\pi}{2} - \frac{1}{4} [\sin 2x]_0^\pi = \frac{\pi}{2} \end{aligned}$$

Systems of equations, with a phantom to align the signs:

$$\begin{array}{rcl} 2x + 3y - z & = & 5 \\ x - y + 4z & = & -2 \\ 3x + 2y + 2z & = & 9 \end{array} \quad \Rightarrow \quad \begin{pmatrix} 2 & 3 & -1 \\ 1 & -1 & 4 \\ 3 & 2 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 5 \\ -2 \\ 9 \end{pmatrix}$$

Ruled arrays

Grade	Count	Share
A	12	24 %
B	23	46 %
C	15	30 %

	0	1
0	0	1
1	1	0

Growing delimiters

$\left(\frac{a}{\frac{b}{\frac{c}{d}}}\right)$ $\left[\sum_{i=1}^n \frac{1}{i^2}\right]^2$ $\{x \in \mathbb{R} \mid x^2 < 2\}$ $\frac{\mathrm{d}y}{\mathrm{d}x}\Big|_{x=0}$ $\langle \psi | \phi \rangle$

$\left\langle \left[\left[\left(\frac{\frac{a}{b}}{\frac{c}{d}} \right) \right] \right] \right\rangle$ $(x)(x)(x)(x)$

Braces, stacks and boxes

$\underbrace{1 + 2 + \cdots + n}_{n \text{ terms}} = \frac{n(n+1)}{2}$ $\overbrace{x \cdot x \cdots x}^{k \text{ factors}} = x^k$ $a \stackrel{\text{def}}{=} b$ $A \overset{f}{\longrightarrow} B$

$E = mc^2$

$\int_{-\infty}^{\infty} e^{-x^2} \mathrm{d}x = \sqrt{\pi}$

colored x + y