

Sage Quick Reference (Basic Math)

Shing Hin Yu (based on work of W. Stein)

Latest version at wiki.sagemath.org/quickref

笔记本

评估格子: <Shift-Enter>

创造新格子: <alt-enter>

分裂格子:<control-;>

连接格子:<control-backspace>

插入数学格子: 按格与格之间的蓝色线

插入文字或 HTML 格子: <shift-按格与格之间的蓝色线>

删除格子: 删除内容后再按<backspace>键

数字的类型

整数: $\mathbb{Z} = \mathbb{ZZ}$ 例如 -2 -1 0 110^100

有理数: $\mathbb{Q} = \mathbb{QQ}$ 例如 1/2 1/1000314/100-42

小数: \mathbb{R} 例如 0.50.0013.14-42.

复数: \mathbb{C} **CC** 例如 1+i 2.5-3*i

基本常量和函数

常量: $\pi = \text{pi}$ $e = \text{e}$ $i = \text{i}$ $\infty = \text{oo}$

近似数: $\text{pi.n}(\text{digits}=18) = 3.14159265358979324$

函数: $\text{sin cos tan sec csc cot sinh cosh tanh}$

$\text{sech csch coth log ln exp}$

$ab = a*b$ $\frac{a}{b} = a/b$ $a^b = a^b$ $\sqrt{x} = \text{sqrt}(x)$

符号变元: 例如 $t, u, v, y, z = \text{var}('t u v y z')$

定义函数: $f(x) = x^2$ $f(x) = x^2$

词句的操作

$\text{factor}(\dots)$ $\text{expand}(\dots)$ $(\dots).\text{simplify}(\dots)$

象征性的方程: $f(x) = g(x)$

$_$ 是以前的输出

$_+a _ -a _ *a _ /a$ 操纵方程

解 $f(x) = g(x)$: $\text{solve}(f(x) == g(x), x)$

$\text{solve}([f(x, y) == 0, g(x, y) == 0], x, y)$

$\text{find_root}(f(x), a, b)$ 找 $x \in [a, b]$ s.t. $f(x) \approx 0$

$\sum_{i=k}^n f(i) = \text{sum}([f(i) \text{ for } i \text{ in } [k..n]])$

$\prod_{i=k}^n f(i) = \text{prod}([f(i) \text{ for } i \text{ in } [k..n]])$

微积分

$\lim_{x \rightarrow a} f(x) = \text{limit}(f(x), x=a)$

$\lim_{x \rightarrow a^-} f(x) = \text{limit}(f(x), x=a, \text{dir}='minus')$

$\lim_{x \rightarrow a^+} f(x) = \text{limit}(f(x), x=a, \text{dir}='plus')$

$\frac{d}{dx} f(x) = \text{diff}(f(x), x)$

$\frac{\partial}{\partial x} f(x, y) = \text{diff}(f(x, y), x)$

微分: $\text{diff} = \text{differentiate} = \text{derivative}$

$\int f(x) dx = \text{integral}(f(x), x)$

积分: $\text{integral} = \text{integrate}$

$\int_a^b f(x) dx = \text{integral}(f(x), x, a, b)$

二维图形

线: $\text{line}([(x1, y1), \dots, (xn, yn)], \text{options 选项})$

多边形: $\text{polygon}([(x1, y1), \dots, (xn, yn)], \text{选项})$

圆形: $\text{circle}(x, y, r, \text{options 选项})$

文字: $\text{text}('txt', (x, y), \text{options 选项})$

参数图:

$\text{parametric_plot}((f(t), g(t)), \text{tmin}, \text{tmax}, \text{options})$

极坐标图: $\text{polar_plot}(f(t), \text{tmin}, \text{tmax}, \text{options})$

三维图形

三维线:

$\text{line3d}([(x1, y1, z1), \dots, (xn, yn, zn)], \text{options})$

球体: $\text{sphere}((x, y, z), r, \text{options})$

四面体: $\text{tetrahedron}((x, y, z), \text{size}, \text{options})$

立方體: $\text{cube}((x, y, z), \text{size}, \text{options})$

八面体: $\text{octahedron}((x, y, z), \text{size}, \text{options})$

十二面体: $\text{dodecahedron}((x, y, z), \text{size}, \text{options})$

二十面体: $\text{icosahedron}((x, y, z), \text{size}, \text{options})$

三维图像: $\text{plot3d}(f(x, y), [x_b, x_e], [y_b, y_e], \text{options})$

离散数学

$\lfloor x \rfloor$ $\lceil x \rceil$

n除以k的余数= $n \% k$ $k | n$ iff $n \% k == 0$

$n! = \text{factorial}(n)$ $\binom{x}{m} = \text{binomial}(x, m)$

$\emptyset = \text{golden_ratio}$ $\phi(n) = \text{euler_phi}(n)$

字符串,如: $s = 'Hello' = "Hello" = "" + "He" + "llo"$

$s[0] = 'H'$ $s[-1] = 'o'$ $s[1:3] = 'el'$ $s[3:] = 'llo'$

列表,如: $[1, 'Hello', x] = [] + [1, 'Hello'] + [x]$

元组,如: $(1, 'Hello', x)$ (immutable)

组合,如: $\{1, 2, 1, a\} = \text{Set}([1, 2, 1, 'a'])$ ($= \{1, 2, a\}$)

列表对比 \approx 组合符号, 如

$\{f(x) : x \in X; x > 0\} = \text{Set}([f(x) \text{ for } x \text{ in } X \text{ if } x > 0])$

线性代数

$\begin{pmatrix} 1 \\ 2 \end{pmatrix} = \text{vector}([1, 2])$

$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = \text{matrix}([[1, 2], [3, 4]])$

$\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix} = \text{det}(\text{matrix}([[1, 2], [3, 4]]))$

$Av = A^*v$ $A^{-1} = A^{-1}$ $A^t = A.\text{transpose}()$

方法: $\text{nrows}()$ $\text{ncols}()$ $\text>nullity}()$ $\text{rank}()$ $\text{trace}()$...