# 数学符号列表

## Basic math symbols（基本数学符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | equals sign | equality | = | 5 is equal to 2+3 |
|  | not equal sign | inequality | = | 5 is not equal to 4 |
| $$ | approximately equal | approximation |  | ,$ x y$ means x is approximately equal to y |
| $> $ | strict inequality | greater than | > | $ 5 > 4$ 5 is greater than 4 |
|  | strict inequality | less than | < | $ 4 < 5$ 4 is less than 5 |
| $$ | inequality | greater than or equal to |  | , means x is greater than or equal to y |
| $$ | inequality | less than or equal to |  | , means x is less than or equal to y |
|  | parentheses | calculate expression inside first | () |  |
|  | brackets | calculate expression inside first | [] |  |
|  | plus sign | addition | + |  |
|  | minus sign | subtraction | - |  |
| $ $ | plus - minus | both plus and minus operations |  |  |
| $$ | minus - plus | both minus and plus operations |  |  |
| $$ | asterisk | multiplication |  |  |
| $ $ | times sign | multiplication |  |  |
| $. $ | multiplication dot | multiplication | . |  |
| $$ | division sign / obelus | division |  |  |
| $/ $ | division slash | division | / |  |
|  | horizontal line | division / fraction |  |  |
|  | modulo | remainder calculation | mod |  |
|  | period | decimal point, decimal separator | . |  |
| $ a^{b} $ | power | exponent | a^{b} | $ 2^{3} = 8$ |
| $^$ | caret | exponent | ^ |  |
| $ $ | square root | $ . = a$ |  | $ = $ |
| $ $ | cube root | $ . . =a$ |  | $ =2 $ |
| $ $ | fourth root |  |  |  |
|  | n-th root (radical) |  |  |  |
|  | percent |  | % |  |
|  | per-mille |  | ‰ |  |
|  | per-million | $ 1ppm = 1/1000000$ | ppm |  |
|  | per-billion |  | ppb | $10ppb = 3× 10^{-7} $ |
|  | per-trillion | $1ppt = 10^{-12} $ | ppt | $1ppt = 10^{-12} $ |

## Geometry symbols（几何符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | angle | formed by two rays |  | $\angle ABC = 30\degree$ |
| $ $ | measured angle |  |  | $ ABC = 30$ |
| $ $ | spherical angle |  |  | $ AOB = 30$ |
| $ $ | right angle | $= 90\degree$ |  | $ = 90$ |
| $\degree$ | degree | $1 \; turn = 360\degree$ |  | $ = 60$ |
|  | degree | $1 ; turn = 360deg $ | deg | $ = 60deg$ |
|  | prime | arcminute, $1= 60^$ | ^ | $1\degree= 60^\prime$ |
|  | double prime | arcsecond, | ^{} | $ = 60°59{}$ |
|  | line | infinite line |  |  |
| $ $ | line segment | line from point A to point B |  |  |
| $ $ | ray | line that start from point A |  |  |
|  | arc | arc from point A to point B |  | $=60\degree$ |
| $ $ | perpendicular | perpendicular lines (90° angle) |  | $ ⊥ $ |
| $|| $ | parallel | parallel lines | || |  |
|  | congruent to | equivalence of geometric shapes and size |  | $ ABCXYZ$ |
| $$ | similarity | same shapes, not same size |  | $ ABC XYZ$ |
| $$ | triangle | triangle shape |  | $ ABCBCD$ |
|  | distance | distance between points x and y | |x-y| |  |
| $$ | pi constant | $= 3.141592654… $ is the ratio between the circumference and diameter of a circle |  |  |
|  | radians | radians angle unit | rad | $360\degree = 2 \pi \; rad$ |
|  | radians | radians angle unit | ^{c} | $360\degree= 2\pi ^{c}$ |
|  | gradians / gons | grads angle unit | grad | $360\degree= 400 \; grad$ |
|  | gradians / gons | grads angle unit | ^{g} | $360\degree= 400^{g}$ |

## Algebra symbols（代数符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | variable | unknown value to find | x | when , then |
| $$ | equivalence | identical to |  |  |
|  | equal by definition | equal by definition |  |  |
|  | equal by definition | equal by definition | := |  |
| $ $ | approximately equal | weak approximation |  |  |
| $$ | approximately equal | approximation |  |  |
|  | proportional to | proportional to |  |  |
| $$ | lemniscate | infinity symbol |  |  |
| $$ | much less than | much less than |  |  |
| $$ | much greater than | much greater than |  |  |
|  | parentheses | calculate expression inside first | () |  |
|  | brackets | calculate expression inside first | [] |  |
|  | braces | set | {} |  |
| $ x $ | floor brackets | rounds number to lower integer | x | $ $ |
|  | ceiling brackets | rounds number to upper integer | x | $ $ |
|  | exclamation mark | factorial | x! |  |
| $ |x | $ | vertical bars | absolute value | |x | |  |
|  | function of x | maps values of to | f(x) |  |
|  | function composition |  | (f g) |  |
|  | open interval |  | (a,b) |  |
|  | closed interval |  | [a,b] |  |
| $$ | delta | change / difference |  | $ t = t\_{1} - t\_{0} $ |
| $ $ | discriminant | $ = b^{2} - 4ac$ |  |  |
|  | sigma | summation - sum of all values in range of series |  | $ x\_{i} = x\_{1} +x\_{2} + +x\_{n} $ |
|  | sigma | double summation |  |  |
|  | capital pi | product - product of all values in range of series |  | $ x\_{i} = x\_{1}∙x\_{2}∙ ∙x\_{n}$ |
|  | e constant / Euler’s number |  | e | $e = (1+1/x)x, x $ |
| $$ | Euler-Mascheroni constant | $ = 0.5772156649…$ |  |  |
| $$ | golden ratio | golden ratio constant |  |  |
| $$ | pi constant | is the ratio between the circumference and diameter of a circle |  |  |

## Linear Algebra Symbols （线性代数符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | dot | scalar product | · |  |
| $ $ | cross | vector product |  |  |
|  | tensor product | tensor product of A and B |  |  |
|  | inner product |  | x,y |  |
| $ | brackets | matrix of numbers |  | $ |
| $() $ | parentheses |  | () | $ (a) $ |
|  | determinant | determinant of matrix A | |A| |  |
| $det (A) $ | determinant | determinant of matrix A | det (A) |  |
| $||x || $ | double vertical bars | norm | ||x || |  |
| $ A^{T} $ | transpose | matrix transpose | A^{T} | $ (A^{T}) *{ij}= (A)* {ji}$ |
|  | Hermitian matrix | matrix conjugate transpose | A^{†} | $(A^{†}) *{ij}=* {ji} $ |
| $A^{ } $ | Hermitian matrix | matrix conjugate transpose | A^{ } |  |
| $A^{-1} $ | inverse matrix |  | A^{-1} |  |
|  | matrix rank | rank of matrix A | rank(A) |  |
|  | dimension | dimension of matrix A | dim(U) | $ dim(U) = 3$ |

## Probability and statistics symbols（概率统计符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | probability function | probability of event A | P(A) |  |
|  | probability of events intersection | probability that of events A and B | P(A B) |  |
|  | probability of events union | probability that of events A or B | P(A B) |  |
|  | conditional probability function | probability of event A given event B occured | P(A B) |  |
|  | probability density function (pdf) |  | f (x) |  |
|  | cumulative distribution function (cdf) |  | F(x) |  |
| $$ | population mean | mean of population values |  |  |
|  | expectation value | expected value of random variable X | E(X) |  |
|  | conditional expectation | expected value of random variable X given Y | E(X Y) |  |
|  | variance | variance of random variable X | var(X) |  |
| $ ^{2} $ | variance | variance of population values | ^{2} | $ ^{2}=4 $ |
|  | standard deviation | standard deviation of random variable X | std(X) |  |
| $ \_{X} $ | standard deviation | standard deviation value of random variable X | \_{X} |  |
| $ $ | median | middle value of random variable x |  |  |
|  | covariance | covariance of random variables X and Y | cov(X,Y) |  |
|  | correlation | correlation of random variables X and Y | corr(X,Y) |  |
| $ \_{X,Y} $ | correlation | correlation of random variables X and Y | \_{X,Y} | $ \_{X,Y}=0.6 $ |
|  | summation | summation - sum of all values in range of series |  | $ *{x=1}^4 x*{i} = x\_{1} +x\_{2} +x\_{3} +x\_{4} $ |
|  | double summation | double summation |  |  |
|  | mode | value that occurs most frequently in population | Mo |  |
|  | mid-range |  | MR |  |
|  | sample median | half the population is below this value | Md |  |
| $ Q\_{1} $ | lower / first quartile | 25% of population are below this value | Q\_{1} |  |
| $ Q\_{2} $ | median / second quartile | 50% of population are below this value = median of samples | Q\_{2} |  |
| $ Q\_{3} $ | upper / third quartile | 75% of population are below this value | Q\_{3} |  |
| $ $ | sample mean | average / arithmetic mean |  | $ = (2+5+9) / 3 = 5.333$ |
| $S^{2} $ | sample variance | population samples variance estimator | S^{2} | $S^{2}=4 $ |
|  | sample standard deviation | population samples standard deviation estimator | S |  |
| $Z\_{x} $ | standard score | $Z\_{x} =(x- )/ S\_{x} $ | Z\_{x} |  |
| $X $ | distribution of X | distribution of random variable X | X |  |
|  | normal distribution | gaussian distribution | N( , ^{2} ) |  |
|  | uniform distribution | equal probability in range a,b | U(a,b) |  |
|  | exponential distribution |  | exp( ) |  |
|  | gamma distribution |  | gamma(c, ) |  |
| $x^{2} (k) $ | chi-square distribution | $f(x)= x^{k/2-1} e^{-x/2}/( 2^{k/2} (k/2) ) $ | x^{2} (k) |  |
|  | F distribution |  | F ( k\_{1} , k\_{2} ) |  |
|  | binomial distribution | $f(k)=*{n}C*{k} p^{k} (1-p)^{n-k} $ | Bin(n,p) |  |
|  | Poisson distribution |  | Poisson( ) |  |
|  | geometric distribution | $f(k)=p (1-p)^{k} $ | Geom(p) |  |
|  | hyper-geometric distribution |  | HG(N,K,n) |  |
|  | Bernoulli distribution |  | Bern(p) |  |

## Combinatorics Symbols（组合符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | factorial |  | n! |  |
| $n^{ P\_{k} } $ | permutation | $n^{ P\_{k} } = $ | n^{ P\_{k} } | $5^{ P\_{3} }=5!/(5-3)!=60 $ |
| $n^{ C\_{k} } $ ${\tbinom {n}{k}}$ | combination | $n^{ C\_{k} } ={} = $ | n^{ C\_{k}{} |  |

## Set theory symbols（集合符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | set | a collection of elements |  | A=,7,9,14B=,14,28 |
|  | intersection | objects that belong to set A and set B | A B |  |
|  | union | objects that belong to set A or set B | A B |  |
|  | subset | A is a subset of B. set A is included in set B. | A B |  |
|  | proper subset / strict subset | A is a subset of B, but A is not equal to B. | A B |  |
|  | not subset | set A is not a subset of set B |  |  |
|  | superset | A is a superset of B. set A includes set B | A B | $,14,28 ,14,28 $ |
|  | proper superset / strict superset | A is a superset of B, but B is not equal to A. | A B |  |
|  | not superset | set A is not a superset of set B | A B | $,14,28 , 66 $ |
| $2^{A} $ | power set | all subsets of A | 2^{A} |  |
|  | power set | all subsets of A | (A) |  |
|  | equality | both sets have the same members | A = B |  |
| $A^{c} $ | all the objects that do not belong to set A |  | A^{c} |  |
|  | relative complement | objects that belong to A and not to B | A B |  |
|  | relative complement | objects that belong to A and not to B | A - B |  |
|  | symmetric difference | objects that belong to A or B but not to their intersection | A B |  |
|  | symmetric difference | objects that belong to A or B but not to their intersection | A B |  |
|  | element of, belongs to | set membership | a A |  |
|  | not element of | no set membership | x A |  |
|  | ordered pair | collection of 2 elements | (a,b) |  |
|  | cartesian product | set of all ordered pairs from A and B | A B |  |
| $A$ | cardinality | the number of elements of set A | A |  |
|  | cardinality | the number of elements of set A | #A | $ #A =3$ |
| $$ | vertical bar | such that |  |  |
| $ \_{0} $ | aleph-null | infinite cardinality of natural numbers set | \_{0} |  |
| $ \_{1} $ | aleph-one | cardinality of countable ordinal numbers set | \_{1} |  |
|  | empty set | = ; $ |  |  |
|  | universal set | set of all possible values |  |  |
| $\_{0} $ | natural numbers / whole numbers set (with zero) |  | \_{0} |  |
| $\_{1} $ | natural numbers / whole numbers set (without zero) |  | \_{1} |  |
| $ $ | integer numbers set | $ =-3,-2,-1,0,1,2,3, $ |  | $-6 $ |
| $ $ | rational numbers set |  |  | $2/6 $ |
| $ $ | real numbers set |  |  |  |
| $ $ | complex numbers set |  |  |  |

## Logic symbols（逻辑符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
|  | and | and |  | $ x y$ |
| $ ^$ | caret / circumflex | and | x ^y |  |
|  | ampersand | and | & |  |
|  | plus | or | + |  |
| $$ | reversed caret | or |  |  |
| $$ | vertical line | or |  |  |
| $x’ $ | single quote | not - negation | x’ | $x’ $ |
| $ $ | bar | not - negation |  | $ $ |
| $$ | not | not - negation |  |  |
|  | exclamation mark | not - negation | ! |  |
| $$ | circled plus / oplus | exclusive or - xor |  |  |
| $ $ | tilde | negation |  |  |
| $$ | implies |  |  |  |
| $$ | equivalent | if and only if (iff) |  |  |
| $$ | equivalent | if and only if (iff) |  |  |
| $$ | for all |  |  |  |
| $$ | there exists |  |  |  |
| $$ | there does not exists |  |  |  |
|  | therefore |  |  |  |
|  | because / since |  |  |  |

## Calculus & analysis symbols（微积分和分析符号）

| Symbol | Symbol Name | Meaning / definition | LaTeX | Example |
| --- | --- | --- | --- | --- |
| $ \_{xx0}f(x)$ | imit | limit value of a function | \_{xx0}f(x) |  |
| $$ | epsilon | represents a very small number, near zero |  | $ $ |
|  | e constant / Euler’s number |  | e | $e=lim (1+1/x)^{x} ,;x $ |
|  | derivative | derivative - Lagrange’s notation | y ’ | $(3 x^{3} )’=9 x^{2} $ |
|  | econd derivative | derivative of derivative | y ’’ |  |
| $y^{(n)} $ | nth derivative | n times derivation | y^{(n)} |  |
| $ $ | derivative | derivative - Leibniz’s notation |  | $d(3 x^{3} )/dx=9 x^{2} $ |
| $ $ | second derivative | derivative of derivative |  |  |
| $ $ | nth derivative | n times derivation |  |  |
|  | time derivative | derivative by time - Newton’s notation |  |  |
|  | time second derivative | derivative of derivative |  |  |
| $D\_{x}y $ | derivative | derivative - Euler’s notation |  |  |
|  | second derivative | derivative of derivative | D\_{x} ^{2} y |  |
| $ $ |  |  |  |  |
|  | integral | opposite to derivation |  |  |
| $$ | double integral | integration of function of 2 variables |  |  |
|  | triple integral | integration of function of 3 variables |  |  |
|  | closed contour / line integral |  |  |  |
|  | closed surface integral |  |  |  |
|  | closed volume integral |  |  |  |
|  | closed interval |  | [a,b] |  |
|  | open interval |  | (a,b) |  |
|  | imaginary unit | $i= $ | i |  |
| $z^{ } $ | complex conjugate |  | z^{ } |  |
| $ $ | complex conjugate |  |  | $ =3-2i$ |
|  | real part of a complex number |  | Re(z) |  |
|  | imaginary part of a complex number |  | Im(z) |  |
| $z$ | absolute value/magnitude of a complex number | $z= a+bi= $ | z | $-2i= $ |
|  | argument of a complex number | The angle of the radius in the complex plane | arg(z) | $arg(3+2i)=33.7\degree$ |
|  | nabla / del | gradient / divergence operator |  |  |
|  | vector |  |  |  |
| $ $ | unit vector |  |  |  |
|  | convolution |  |  |  |
|  | Laplace transform |  |  |  |
|  | Fourier transform |  |  |  |
| $$ | delta function |  |  |  |
| $$ | lemniscate | infinity symbol |  |  |

## Numeral symbols（数字符号）

| Name | Western Arabic | Roman | Eastern Arabic | Hebrew |
| --- | --- | --- | --- | --- |
| zero | 0 |  | ٠ |  |
| one | 1 | I | ١ | א |
| two | 2 | II | ٢ | ב |
| three | 3 | III | ٣ | ג |
| four | 4 | IV | ٤ | ד |
| five | 5 | V | ٥ | ה |
| six | 6 | VI | ٦ | ו |
| seven | 7 | VII | ٧ | ז |
| eight | 8 | VIII | ٨ | ח |
| nine | 9 | IX | ٩ | ט |
| ten | 10 | X | ١٠ | י |
| eleven | 11 | XI | ١١ | יא |
| twelve | 12 | XII | ١٢ | יב |
| thirteen | 13 | XIII | ١٣ | יג |
| fourteen | 14 | XIV | ١٤ | יד |
| fifteen | 15 | XV | ١٥ | טו |
| sixteen | 16 | XVI | ١٦ | טז |
| seventeen | 17 | XVII | ١٧ | יז |
| eighteen | 18 | XVIII | ١٨ | יח |
| nineteen | 19 | XIX | ١٩ | יט |
| twenty | 20 | XX | ٢٠ | כ |
| thirty | 30 | XXX | ٣٠ | ל |
| forty | 40 | XL | ٤٠ | מ |
| fifty | 50 | L | ٥٠ | נ |
| sixty | 60 | LX | ٦٠ | ס |
| seventy | 70 | LXX | ٧٠ | ע |
| eighty | 80 | LXXX | ٨٠ | פ |
| ninety | 90 | XC | ٩٠ | צ |
| one hundred | 100 | C | ١٠٠ | ק |

## Greek alphabet letters （希腊字母）

| Upper Case Letter | Lower Case Letter | Greek Letter Name | English Equivalent | Letter Name Pronounce |
| --- | --- | --- | --- | --- |
| $ {} $ | α | Alpha | a | al-fa |
| $ {} $ | β | Beta | b | be-ta |
| $ {} $ | γ | Gamma | g | ga-ma |
| $ {} $ | δ | Delta | d | del-ta |
| $ {} $ | ε | Epsilon | e | ep-si-lon |
| $ {} $ | ζ | Zeta | z | ze-ta |
| $ {} $ | η | Eta | h | eh-ta |
| $ {} $ | θ | Theta | th | te-ta |
| $ {} $ | ι | Iota | i | io-ta |
| $ {} $ | κ | Kappa | k | ka-pa |
| $ {} $ | λ | Lambda | l | lam-da |
| $ {} $ | μ | Mu | m | m-yoo |
| $ {} $ | ν | Nu | n | noo |
| $ {} $ | ξ | Xi | x | x-ee |
| $ {} $ | ο | Omicron | o | o-mee-c-ron |
| $ {} $ | π | Pi | p | pa-yee |
| $ {} $ | σ | Sigma | s | sig-ma |
| $ {} $ | τ | Tau | t | ta-oo |
| $ {} $ | υ | Upsilon | u | oo-psi-lon |
| $ {} $ | φ | Phi | ph | f-ee |
| $ {} $ | χ | Chi | ch | kh-ee |
| $ {} $ | ψ | Psi | ps | p-see |
| $ {} $ | ω | Omega | o | o-me-ga |

$ {} $ LaTex: {}

## Roman numerals（罗马数字）

| Number | Roman numeral |
| --- | --- |
| 0 | not defined |
| 1 | I |
| 2 | II |
| 3 | III |
| 4 | IV |
| 5 | V |
| 6 | VI |
| 7 | VII |
| 8 | VIII |
| 9 | IX |
| 10 | X |
| 11 | XI |
| 12 | XII |
| 13 | XIII |
| 14 | XIV |
| 15 | XV |
| 16 | XVI |
| 17 | XVII |
| 18 | XVIII |
| 19 | XIX |
| 20 | XX |
| 30 | XXX |
| 40 | XL |
| 50 | L |
| 60 | LX |
| 70 | LXX |
| 80 | LXXX |
| 90 | XC |
| 100 | C |
| 200 | CC |
| 300 | CCC |
| 400 | CD |
| 500 | D |
| 600 | DC |
| 700 | DCC |
| 800 | DCCC |
| 900 | CM |
| 1000 | M |
| 5000 | V |
| 10000 | X |
| 50000 | L |
| 100000 | C |
| 500000 | D |
| 1000000 | M |

参考文献（References）:

[1] Math Symbols List (RapidTables), <https://www.rapidtables.com/math/symbols/Basic_Math_Symbols.html>.

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