List of Symbols*
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Matthew Barry is writing an HTML5/javascript/MathJax parser/renderer as an Honors Senior Thesis. It may be viewed at: `http://custom.komputerwiz.net:8000/~matthew/interpreter-2/` Below is a list of the symbols that can be entered, organized syntax usage and by mathematical topic. Please send comments and suggestions for additions and changes to the authors.

1 Symbols by Syntax Usage

1.1 Constants

Name	Symbol	Code	Description
Pi	π	`#pi, #p`	$3.14\cdots$
E	e	`#e`	$2.718\cdots$, Natural Base, Euler-Napier number
gamma	γ	`#gamma`	$0.577\cdots$, Euler-Mascheroni constant
Imaginary Unit	i	`#i`	$\sqrt{-1}$
Infinity	∞	`#infinity`, `infinity`	
True	$\mathbf{T}$	`#T`, `#t`, `#true`, `true`	
False	$\mathbf{F}$	`#F`, `#f`, `#false`, `false`	
Natural Numbers	$\mathbb{N}$	`#N`	
Integer Ring	$\mathbb{Z}$	`#Z`	
Rational Field	$\mathbb{Q}$	`#Q`	
Real Field	$\mathbb{R}$	`#R`	
Complex Field	$\mathbb{C}$	`#C`	
Quaternion Ring	$\mathbb{H}$	`#H`	Hamilton numbers
Octonion Algebra	$\mathbb{O}$	`#O`	Cayley numbers, Type "Oh".
Universal Set	$\mathbb{U}$	`#U`	
Empty Set	$\emptyset$	`#empty`, `{}`	
Zero Vector	$\vec{0}$	`#v0`	
x Unit Vector	$\hat{\imath}$	`#vi`	
y Unit Vector	$\hat{\jmath}$	`#vj`	
z Unit Vector	$\hat{k}$	`#vk`	
Zero Matrix	$\mathbb{0}$	`#0`	Type "zero".
Unit Matrix	$\mathbb{I}$	`#1`	Type "one".

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1.2 Unary Operators

Name	Symbol	Code	Description
Positive	$+a$	`+a`	
Negative	$-a$	`-a`	
Positive/Negative	$\pm a$	`&pm a, +/-a`	
Negative/Positive	$\mp a$	`&mp a, -/+a`	
Square Root	$\sqrt{a}$	`sqrt(a)`	
Factorial	$n!$	`n!`	
Natural Exponential	$\exp(a)$	`exp(a)`	
Natural Logarithm	$\ln(a)$	`ln(a)`	
Logical Negation	$\neg p$	`not p, ~p, !p`	
Prime derivative	f'	`f'`	Derivative w.r.t. x or first or only variable
Dot derivative	$\dot{f}$	`f.`	Derivative w.r.t. t or second variable
Differential	$\mathrm{d}x$	`&d x`	
Partial Differential	∂x	`&pd x`	
Vector	$\vec{u}$	`&v u`	
Unit Vector	$\hat{u}$	`&u u`	

1.3 Binary Operators

Name	Symbol	Code	Description
Plus	$a + b$	`a+b`	Addition
Minus	$a - b$	`a-b`	Subtraction
Plus/Minus	$a \pm b$	`a &pm b, a+/-b`	
Minus/Plus	$a \mp b$	`a &mp b, a-/+b`	
Times	$a \cdot b$	`a*b`	Multiplication
Divide	$\frac{a}{b}$	`a/b`	Division
Power	a^b	`a^b, a**b`	Exponentiation
n-th Root	$\sqrt[n]{a}$	`root(a, n)`	
Logarithm with Base	$\log_b a$	`log(a, b)`	
Modulus	$a \pmod n$	`a%n, a mod n`	
Subscript	a_b	`a &_ b`	Indexing
Superscript	a^b	`a &^ b`	Indexing
Set Union	$a \cup b$	`a union b`	
Set Intersection	$a \cap b$	`a intersect b`	
Set Difference	$a \setminus b$	`a \ b`	
Such That	$p : q,\ p \mid q$	`p:q, p|q`	Used with set builder and quantifiers
Conjunction	$p \wedge q$	`p and q, p && q`	Logical AND
Disjunction	$p \vee q$	`p or q, p || q`	Logical OR
Exclusion	$p \oplus q$	`p xor q`	Logical XOR
Conditional	$p \to q$	`p implies q, p -> q, q if p, q when p, q whenever p`	
Biconditional	$p \leftrightarrow q$	`p iff q, p <-> q`	
Function Composition	$f \circ g$	`f @ g`	
Dot Product	$\vec{a} \cdot \vec{b}$	`&v a &.  &v b`	
Cross Product	$\vec{a} \times \vec{b}$	`&v a &x &v b`	

1.4 Relations

Name	Symbol	Code	Description
Equal	$=$	`=, ==`	
Not Equal	$\neq$	`!=, /=, <>`	
Less than	$<$	`<`	
Greater than	$>$	`>`	
Less than or Equal	$\leq$	`<=`	
Greater than or Equal	$\geq$	`>=`	
Subset	$\subseteq$	`subset`	
Superset	$\supseteq$	`superset, supset`	
Proper Subset	$\subset$	`propersubset, propsubset, psubset`	
Proper Superset	$\supset$	`propersuperset, propsuperset, psuperset`	
Inclusion	$\in$	`propersupset, propsupset, psupset`	
		`in`	
Equivalent	$\equiv$	`===, equiv`	
Not Equivalent	$\not\equiv$	`!==, /==, nequiv`	

1.5 Delimiters

Name	Symbol	Code	Description
Parentheses	$(\ )$	`( )`	Order of operation
Square Brackets	$[\ ]$	`[ ]`	Lists
Curly Braces	$\{\ \}$	`{ }`	Sets
Angle Brackets	$\langle\ \rangle$	`< >, <: :>`	Vectors
Vertical Bars	$\|\ \|$	`| |, |: :|`	Absolute Value, Length, Determinant, Norm
Double Bars	$\|\|\ \|\|$	`|| ||, ||: :||`	Length, Norm
Subscript	a_b	`a &_ b`	Indexing
Superscript	a^b	`a &^ b`	Indexing
Such That	$p : q,\ p \mid q$	`p : q, p | q`	Used with set builder and quantifiers
Open Interval	(a, b)	`(:a,b:)`	Exclusive Range Delimiters
Closed Interval	$[a, b]$	`[:a,b:]`	Inclusive Range Delimiters
Half-Open Interval	$[a, b)$	`[:a,b:)`	Mixed Range Delimiters

Note that some delimiters have more than one format either with or without colons. Namely, absolute value can be written as `| ... |` or `|: ... :|`, norm can be written as `|| ... ||` or `||: ... :||`, and vector literals can be surrounded by either `< ... >` or `<: ... :>`. Of the listed alternate delimiters, those without colons are *context-aware* in that they have different meanings and therefore cannot be automatically matched by the Lexer. Additionally, if an expression opened with one type of delimiter, it must be closed with the same type (i.e. context-aware vs. specialized).

1.6 Functions

Name	Symbol	Code	Description
Trig	$\sin(\theta)$, ...	`sin(theta)`, ...	Also cos, tan, cot, sec, csc
Inverse Trig	$\arcsin(x)$, ...	`arcsin(x)`, ...	Also arccos, arctan, arccot, arcsec, arccsc
Hyperbolic Trig	$\sinh(\lambda)$, ...	`sinh(lambda)`, ...	Also cosh, tanh, coth, sech, csch
Inv. Hyp. Trig	$\operatorname{arcsinh}(x)$, ...	`arcsinh(x)`, ...	Also arccosh, arctanh, arccoth, arcsech, arccsch
Absolute Value	$\lvert a \rvert$	`abs(a)`	
Square Root	$\sqrt{a}$	`sqrt(a)`	
nth Root	$\sqrt[n]{a}$	`root(a, n)`	
Natural Exponential	$\exp(a)$	`exp(a)`	
Natural Logarithm	$\ln(a)$	`ln(a)`	
Logarithm with Base	$\log_b a$	`log(a, b)`	
Limit	$\lim_{x \to a} f(x)$	`lim(f(x), a, x)` `limit(f(x), x, a)`	
Derivative	$\frac{\mathrm{d}}{\mathrm{d}x}(f(x))$	`diff(f(x), x)`	
Partial Derivative	$\frac{\partial}{\partial x}(f(x,y))$	`pdiff(f(x,y), x)`	
Indefinite Integral	$\int f(x)\,\mathrm{d}x$	`int(f(x),x)`	
Definite Integral	$\int_a^b f(x)\,\mathrm{d}x$	`int(f(x),x,a,b)`	
Sum Over Set	$\sum_{i \in S} a_i$	`sum(a&_i, i in S)`	
Sum Over Range	$\sum_{i=a}^{b} a_i$	`sum(a&_i,i,a,b)`	
Product Over Set	$\prod_{i \in S} a_i$	`prod(a&_i, i in S)` `product(a&_i, i in S)`	
Product Over Range	$\prod_{i=a}^{b} a_i$	`prod(a&_i,a,b)` `product(a&_i,a,b)`	
Universal Quantifier	$\forall x P(x)$	`forall x : P(x)`	"For all"; chain nested quantifiers with `;`
Existential Quantifier	$\exists x P(x)$	`exists x : P(x)`	"There exists"
Unique Quantifier	$\exists! x P(x)$	`unique x : P(x)`	"There exists a unique"

2 Symbols by Topic

2.1 Arithmetic

Name	Symbol	Code	Description
i	i	`i`	$\sqrt{-1}$
Plus, Positive	$+$	`+`	binary or unary
Minus, Negative	$-$	`-`	binary or unary
Plus/Minus	$\pm$	`&pm, +/-`	binary or unary
Minus/Plus	$\mp$	`&mp, -/+`	binary or unary
Times	$\cdot$	`*`	
Divide	$/$	`/`	
Power	a^b	`a^b`	
Square Root	$\sqrt{a}$	`sqrt(a)`	
n-th Root	$\sqrt[n]{a}$	`root(a,n)`	
Log Base n	$\log_n a$	`log(a,n)`	
Natural Exponential	$\exp(a), e^a$	`exp(a), e^a`	
Natural Logarithm	$\ln(a)$	`ln(a)`	
Absolute Value	$\|a\|$	`abs(a)`	
Factorial	!	`!`	
Modulus	$a \pmod n$	`a%n, a mod n`	
Equal	$=$	`=, ==`	
Not Equal	$\neq$	`!=, /=, <>`	
Less Than	$<$	`<`	
Greater Than	$>$	`>`	
Less Than or Equal	$\leq$	`<=`	
Greater Than or Equal	$\geq$	`>=`	
Parentheses	$(\quad)$	`( )`	

2.2 Algebra

Name	Symbol	Code	Description
Natural Numbers	$\mathbb{N}$	`#N`	
Integers	$\mathbb{Z}$	`#Z`	
Rational Numbers	$\mathbb{Q}$	`#Q`	
Real Numbers	$\mathbb{R}$	`#R`	
Complex Numbers	$\mathbb{C}$	`#C`	
Function Composition	$f \circ g$	`f @ g`	
Sum Over Set	$\sum_{i \in S} a_i$	`sum(a&_i, i in S)`	
Sum Over Range	$\sum_{i=a}^{b} a_i$	`sum(a&_i,i,a,b)`	
Product Over Set	$\prod_{i \in S} a_i$	`prod(a&_i, i in S)` `product(a&_i, i in S)`	
Product Over Range	$\prod_{i=a}^{b} a_i$	`prod(a&_i,a,b)` `product(a&_i,a,b)`	

2.3 Geometry

Name	Symbol	Code	Description
Pi	π	`#pi, #p`	$3.14\cdots$
Open Interval	(a,b)	`(:a,b:)`	Exclusive Range Delimiters
Closed Interval	$[a,b]$	`[:a,b:]`	Inclusive Range Delimiters
Half-Open Intervals	$[a,b)$	`[:a,b:)`	Mixed Range Delimiters
Vector Components	$\langle a,b,c \rangle$	`<a,b,c>`, `<:a,b,c:>`	
Vector	$\vec{a}$	`&v a`	
Unit Vector	$\hat{a}$	`&u a`	
Vector Length	$\lvert\vec{a}\rvert, \lVert\vec{a}\rVert$	`|&v a|`, `|:&v a:|`, `||&v a||`, `||:&v a:||`	
Zero Vector	$\vec{0}$	`#v0`	
x Unit Vector	$\hat{\imath}$	`#vi`	
y Unit Vector	$\hat{\jmath}$	`#vj`	
z Unit Vector	$\hat{k}$	`#vk`	
Dot Product	$\vec{a} \cdot \vec{b}$	`&v a &.  &v b`	
Cross Product	$\vec{a} \times \vec{b}$	`&v a &x &v b`	

2.4 Trigonometry

Name	Symbol	Code	Description
Trig	$\sin(\theta)$, ...	`sin(theta)`, ...	Also cos, tan, cot, sec, csc
Inverse Trig	$\arcsin(x)$, ...	`arcsin(x)`, ...	Also arccos, arctan, arccot, arcsec, arccsc
Hyperbolic Trig	$\sinh(\lambda)$, ...	`sinh(lambda)`, ...	Also cosh, tanh, coth, sech, csch
Inv. Hyp. Trig	$\operatorname{arcsinh}(x)$, ...	`arcsinh(x)`, ...	Also arccosh, arctanh, arccoth, arcsech, arccsch

2.5 Discrete

Name	Symbol	Code	Description
Natural Numbers	$\mathbb{N}$	`#N`	
Integers	$\mathbb{Z}$	`#Z`	
Factorial	$!$	`!`	
Modulus	$a \pmod n$	`a%n`, `a mod n`	
Sum Over Set	$\sum_{i \in S} a_i$	`sum(a&_i, i in S)`	
Sum Over Range	$\sum_{i=a}^{b} a_i$	`sum(a&_i,i,a,b)`	
Product Over Set	$\prod_{i \in S} a_i$	`prod(a&_i, i in S)` `product(a&_i, i in S)`	
Product Over Range	$\prod_{i=a}^{b} a_i$	`prod(a&_i,a,b)` `product(a&_i,a,b)`	

2.6 Calculus

Name	Symbol	Code	Description
Pi	π	`#pi, #p`	$3.14\cdots$
e	e	`#e`	$2.718\cdots$, Natural Base, Euler-Napier number
gamma	γ	`#gamma`	$0.577\cdots$, Euler-Mascheroni constant
Limit	$\lim_{x\to a} f(x)$	`lim(f(x), a, x)` `limit(f(x), x, a)`	
Derivative	$\frac{\mathrm{d}}{\mathrm{d}x}(f(x))$	`diff(f(x), x)`	
Partial Derivative	$\frac{\partial}{\partial x}(f(x,y))$	`pdiff(f(x,y), x)`	
Prime derivative	f'	`f'`	Derivative w.r.t. x or first or only variable
Dot derivative	$\dot{f}$	`f.`	Derivative w.r.t. t or second variable
Finite Sum	$\sum_{i=1}^{n} f(x_i)\Delta_i$	`sum(f(x&_i)*Delta&_i,i,1,n)`	
Indefinite Integral	$\int f(x)\,\mathrm{d}x$	`int(f(x),x)`	
Definite Integral	$\int_a^b f(x)\,\mathrm{d}x$	`int(f(x),x,a,b)`	
Differential	$\mathrm{d}x$	`&d x`	
Partial Differential	∂x	`&pd x`	
Infinite Series	$\sum_{i=1}^{\infty} a_i$	`sum(a&_i,i,1,infinity)`	

2.7 Set Theory

Name	Symbol	Code	Description
Set Delimiters	$\{\ \}$	`{ }`	
Such That	$p : q,\ p \mid q$	`p : q, p | q`	
Universal Set	$\mathbb{U}$	`#U`	
Empty Set	$\emptyset$	`#empty, {}`	
Natural Numbers	$\mathbb{N}$	`#N`	
Integer Ring	$\mathbb{Z}$	`#Z`	
Rational Field	$\mathbb{Q}$	`#Q`	
Real Field	$\mathbb{R}$	`#R`	
Complex Field	$\mathbb{C}$	`#C`	
Quaternion Ring	$\mathbb{H}$	`#H`	Hamilton numbers
Octonion Algebra	$\mathbb{O}$	`#O`	Cayley numbers, Type "Oh".
Subset	$\subseteq$	`subset`	
Superset	$\supseteq$	`superset, supset`	
Proper Subset	$\subset$	`propersubset, propsubset, psubset`	
Proper Superset	$\supset$	`propersuperset, propsuperset, psuperset` `propersupset, propsupset, psupset`	
Inclusion	$\in$	`in`	
Set Union	$a \cup b$	`a union b`	
Set Intersection	$a \cap b$	`a intersect b`	
Set Difference	$a \setminus b$	`a \ b`	

2.8 Logic

Name	Symbol	Code	Description
True	**T**	`#T`, `#t`, `#true`, `true`	
False	**F**	`#F`, `#f`, `#false`, `false`	
Conjunction	$p \wedge q$	`p and q`, `p && q`	Logical AND
Disjunction	$p \vee q$	`p or q`, `p || q`	Logical OR
Exclusion	$p \oplus q$	`p xor q`	Logical XOR
Logical Negation	$\neg p$	`not p`, `~p`, `!p`	
Conditional	$p \to q$	`p implies q`, `p -> q`, `q if p`, `q when p`, `q whenever p`	
Biconditional	$p \leftrightarrow q$	`p iff q`, `p <-> q`	
Equivalent	$\equiv$	`===`, `equiv`	
Not Equivalent	$\not\equiv$	`!==`, `/==`, `nequiv`	
Universal Quantifier	$\forall x P(x)$	`forall x : P(x)`	"For all"; chain nested quantifiers with `;`
Existential Quantifier	$\exists x P(x)$	`exists x : P(x)`	"There exists"
Unique Quantifier	$\exists! x P(x)$	`unique x : P(x)`	"There exists a unique"

2.9 Linear Algebra

Name	Symbol	Code	Description
Vector Delimiters	$\langle\ \rangle$	`< >`, `<:  :>`	
Zero Vector	$\vec{0}$	`#v0`	
x Unit Vector	$\hat{\imath}$	`#vi`	
y Unit Vector	$\hat{\jmath}$	`#vj`	
z Unit Vector	$\hat{k}$	`#vk`	
Matrix Delimiters	$[\ ]$	`[ ]`	
Zero Matrix	$\mathbb{O}$	`#0`	Type "zero".
Unit Matrix	$\mathbb{I}$	`#1`	Type "one".