Mr. G's little booklet on

Mathematical Symbols and Definitions

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Symbol	Description
$\in$	*is an element of*
$\notin$	*is not an element of*
$\{ x_1, x_2, \ldots \}$	*the set with elements* $x_1, x_2, \ldots$
$\{ x : \ldots \}$	*the set of all* x *such that …*
$\{ x \mid \ldots \}$	*the set of all* x *such that …*
$n(A)$	*the number of elements in set* A
$\varnothing$	*the empty set*
Y *or* ε	*the universal set*
A'	*the complement of set* A
$\mathbb{N}$	*set of natural numbers,* $\{ 0, 1, 2, 3, \ldots \}$
$\mathbb{Z}$	*set of integers,* $\{ 0, \pm 1, \pm 2, \pm 3, \ldots \}$
$\mathbb{Z}^+$	*set of positive integers,* $\{ 1, 2, 3, \ldots \}$
$\mathbb{Z}_n$	*set of integers modulo* n, $\{1, 2, 3, \ldots, n-1 \}$
Θ	*set of rational numbers* $\{ p/q : p \in \mathbb{Z}, q \in \mathbb{Z}^+ \}$
Θ^+	*set of positive rational numbers,* $\{ x \in \Theta : x > 0 \}$
Θ_0^+	*set of +ve rational numbers and zero,* $\{ x \in \Theta : x \geq 0 \}$
$P \equiv P_0$	*set of real numbers (and note* 0 *is a real number)*
P^+	*set of positive real numbers,* $\{ x \in R : x > 0 \}$
X	*set of complex numbers*
(x, y)	*the ordered pair* x, y
$A(x, y)$	*the point* A *in the plane with Cartesian coordinates* x *and* y
$[AB]$	*the line segment with end points* A *and* B
AB	*the length of* $[AB]$
(AB)	*the line containing points* A *and* B
$C\hat{A}B$	*the angle between* $[CA]$ *and* $[AB]$
ΔCAB	*the triangle whose vertices are* A, B *and* C
$A \times B$	*the cartesian product of sets* A cross B $=\{ (a,b) : a \in A, b \in B \}$
$\subseteq$	*is a subset of*

$\subset$	*is a proper subset of*
$\cup$	*union*
$\cap$	*intersection*
P(A)	*the probability of event* A
P(A)'	*the probability of event "not* A"
P(A | B)	*the probability of event* A *given* B
$x_1, x_2, \ldots$	*observations of a variable*
$f_1, f_2, \ldots$	*frequencies with which the observations* $x_1, x_2, x_3 \ldots$ *occur*
$\bar{x}$ $\overline{X}$	*sample mean*
μ	*population mean*
s_n	*standard deviation of the sample*
σ	*standard deviation of the population*
r	*Pearson's product-moment correlation coefficient*
χ^2	*chi-squared*
[a, b]	*the closed interval,* $\{ x \in R : a \leq x \leq b \}$
[a, b)	*the interval* $\{ x \in R : a \leq x < b \}$
(a, b]	*the interval* $\{ x \in R : a < x \leq b \}$
(a, b)	*the open interval* $\{ x \in R : a < x < b \}$
]a, b [	*the open interval* $\{ x \in R: a < x < b \}$
u_n	*the* n^{th} *term of a sequence or series*
d	*the common difference of an arithmetic sequence*
r	*the common ratio of a geometric sequence*
S_n	*the sum of the first* n *terms of a sequence* $u_1 + u_2 + \ldots + u_n$
y R x	y *is related to* x *by the relation* R
$y \sim x$	y *is equivalent to* x, *in the context of some equivalence relation*
$\neq$	*is not equal to*
$\equiv$	*is identical to* ***or*** *is congruent (equivalent) to*
$\sim$	*is approximately equal to (preferable to* $\approx$ *or* $/$*)*
$\cong$	*is isomorphic to (there exists a one-to-one mapping)*
$\propto$	*is proportional to*

$< / >$	*is less than / is greater than*
$\leq$	*is less than or equal to, is not greater than*
$\geq$	*is greater than or equal to, is not less than*
$\not<$	*is not less than*
$\not>$	*is not greater than*
∞	*infinity*
$p \wedge q$	p AND q *(conjunction)*
$p \vee q$	p OR q *(or both) (disjunction)*
$p \veebar q$	p XOR q *(not both) (exclusive disjunction)*
$\neg p$	NOT p (*preferable to* $\sim p$ *or* p')
$\Rightarrow / \Leftarrow$	p *implies* q *(if* p *then* q*)* / *p is implied by q (if q then p)*
$\Leftrightarrow$	p *implies and is implied by* q *(* p *is equivalent to* q*)*
$\exists$	*there exists*
$\forall$	*for all*
$\sum a_i$	$a_1 + a_2 + \ldots + a_n$
$\prod a_i$	$a_1 \times a_2 \times \ldots \times a_n$
$\sqrt[n]{a}$	a *to the power of* $^1/_n$, n^{th} *root of* a
$\sqrt{a}$	*the positive square root of* a
$\lvert a \rvert$	*the modulus of* a
n !	n *factorial*
$\binom{n}{r}$	*the binomial coefficient*
$f(x)$	*the value of the function* f *at* x / *image of* x *under function* f
$f : A \to B$	f *is a function under which each element set* A *has image in set* B
$f : x \alpha y$	*the function* f *maps the element* x *to the element* y
f^{-1}	*the inverse function of the function* f
$g \circ f$, gf	*composite function* f *and* g *defined by* $(g \circ f)(x)$ or $gf(x)=g(f(x))$
$\lim_{x \to a} f(x)$	*the limit of* $f(x)$ *as* x *tends to* a
Δx, δx	*an increment of* x
$^{dy}/_{dx}$	*the derivative of* y *with respect to* x

$d^n y/dx^n$	*the* n^{th} *derivative of* y *with respect to* x
$f'(x), f''(x), \ldots f^{(n)}(x)$	*first, second …* n^{th} *derivatives of* $f(x)$ *with respect to* x
$\int y\,dx$	*the indefinite integral of* y *with respect to* x
$\int_a^b y\,dx$	*the definite integral of* y *with respect to* x
$\partial V/\partial x$	*the partial derivative of* V *with respect to* x
e	*base of natural logarithms (* $e \cong 2.71828\ldots$*)*
e^x, exp x	*exponential function of* x
log x	*logarithm to the base* 10 *of* x
$\log_a x$	*logarithm to the base* a *of* x
ln x	*natural logarithm of* x *(preferable to* $\log_e x$*)*
sin, cos, tan, cosec, sec, cot	*the circular functions*
$\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$ *etc.*	*inverse circular functions*
sinh, cosh, tanh *etc.*	*the hyperbolic functions*
$\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$ *etc.*	*inverse hyperbolic functions*
z	*a complex number,* $z = x + iy$
$\mathcal{R}(z)$	*the real part of* z, $\mathcal{R}(z) = x$
$\mathcal{I}(z)$	*the imaginary part of* z, $\mathcal{I}(z) = y$
$\lvert z \rvert$	$\sqrt{(a^2 + b^2)}$ *termed* r *the modulus or absolute value*
arg z	*the argument of* z, $\arg z = \tan^{-1} y/x$
$\mathbf{M}$	*a matrix* **M**
$\mathbf{M}^{-1}$	*the inverse of the matrix* **M**
$\mathbf{M}^T$	*the transpose of the matrix* **M**
$\det \mathbf{M}$, $\lvert \mathbf{M} \rvert$	*the determinant of the square matrix* **M**
$\underline{\mathbf{a}}$	*vector* **a**
$\hat{\mathbf{a}}$	*a unit vector in the direction of* **a**
$\underline{\mathbf{i}}$, $\underline{\mathbf{j}}$, $\underline{\mathbf{k}}$	*unit vectors in direction of the cartesian coordinate axes*
$\lvert \underline{\mathbf{a}} \rvert$, *a*	*the magnitude of* $\underline{\mathbf{a}}$
$\underline{\mathbf{a}} \bullet \underline{\mathbf{b}}$	*the scalar product of* $\underline{\mathbf{a}}$ & $\underline{\mathbf{b}}$ *viz.* $\sum_{i=1}^{n} a_i b_i = a_1 b_1 + a_2 b_2 + \ldots$
$\underline{\mathbf{a}} \times \underline{\mathbf{b}}$	*the vector product of* $\underline{\mathbf{a}}$ & $\underline{\mathbf{b}}$ *viz.* $\lvert \underline{\mathbf{a}} \rvert \lvert \underline{\mathbf{b}} \rvert \sin\theta\, \mathbf{n}$

Greek Alphabet				Principle/Simplest Use	English	Type
alpha	Α	*not used*	α	*first root of quadratic*	a	**a**
beta	Β	*Beta function*	β	*second root of quadratic*	b	**b**
gamma	Γ	*Gamma function*	γ	*Euler's constant*	g	**g**
delta	Δ	*Difference operator*	δ	*small increment*	d	**d**
epsilon	Ε	*not used*	ε	*error*	short e	**e**
zeta	Ζ	*not used*	ζ	*Riemann zeta function*	z	**z**
eta	Η	*not used*	η	*efficiency*	long e	**h**
theta	Θ	*asymp. tight bound*	θ	*angle*	th	**q**
iota	Ι	*not used*	ι	*imaginary unit*	i	**i**
kappa	Κ	*not used*	κ	*curvature*	k	**k**
lambda	Λ	*diag. matrix eigen-values*	λ	*failure rate*	l	**l**
mu	Μ	*not used*	μ	*population mean*	m	**m**
nu	Ν	*not used*	ν	*poisson ratio*	n	**n**
xi	Ξ	*grand canonical ensemble*	ξ	*damping coefficient*	x	**x**
omicron	Ο	*limiting behaviour function*	ο	*generally not used*	short o	**o**
pi	Π	*Product operator*	π	*ratio* $^{c}/_{d}$ *circle*	p	**p**
rho	Ρ	*not used*	ρ	*correlation coefficient*	r	**r**
sigma	Σ	*summation*	σ	*standard deviation*	s	**s**
tau	Τ	*not used*	τ	*mean lifetime*	t	**t**
upsilon	Υ	*Bessel function*	υ	*generally not used*	u	**u**
phi	Φ	*cumulative function*	ϕ	*golden ratio*	ph	**f**
phi (alt.)	ϑ	*not used*	φ	***normal function*** ***scalar potential***	ph	**j**
chi	Χ	*probability function*	χ^2	*chi-squared prob.function*	ch	**c**
psi	Ψ	*not used*	ψ	*wave function*	ps	**y**
omega	Ω	*mathematical constant*	ω	*angular frequency*	long o	**w**

stigma	ς					**v**
pomega			ϖ	*angular velocity*		**v**

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Counting

No.	*Greek*	*Latin*
1	*mono*	*uni*
2	*duo*	*bi*
3	*tri*	*tri*
4	*tetra*	*quad*
5	*penta*	*quin*
6	*hexa*	*sex*
7	*hepta*	*sept*
8	*octo*	*oct*
9	*nona*	*non*
10	*deca*	*dec*

These booklets are written and produced by Robert Goodhand

Although the formulae and expressions given have been individually derived and checked errors do creep in. The booklets are also continuously updated.

If you would like the latest issue, just email me at robert.goodhand@gmail.com