APPENDIX 1

GREEK ALPHABET

Letters		*Name*	*Pronun.*
Capital	*Small*		
A	α	alpha	ˈælfə
B	β	beta	ˈbi:tə
Γ	γ	gamma	ˈgæmə
Δ	δ	delta	ˈdeltə
E	ε	epsilon	ˈepsilən
Z	ζ	zeta	ˈzi:tə
H	η	eta	ˈi:tə
Θ	θ	theta	ˈθi:tə
I	ι	iota	aiˈəutə
K	κ	kappa	ˈkæpə
Λ	λ	lambda	ˈlæmbdə
M	μ	mu	mju:

Letters		*Name*	*Pronun.*
Capital	*Small*		
N	ν	nu	nju:
Ξ	ξ	xi	ksai
O	ο	omicron	ˈəumikrən
Π	π	pi	pai
P	ρ	rho	rəu
Σ	σ	sigma	ˈsigmə
T	τ	tau	tau
Y	υ	upsilon	ˈjupsilən
Φ	φ	phi	fai
X	χ	chi	kai
Ψ	ψ	psi	psai
Ω	ω	omega	ˈəumigə

HOW TO READ MATHEMATICAL EXPRESSIONS

Individual mathematicians often have their own way of pronouncing mathematical expressions and in many cases there is no generally accepted "correct" pronunciation. Generally, the shortest versions are preferred. Expressions sounding [ef eks] may be interpreted as any of: fx, $f(x)$, f_x, FX, $\overline{FX}$. The difference is usually made clear by the context. Only in case of possibility of confusion longer forms are used: *f* multiplied by *x*, the function of *x*, *f* sub *x*, line FX, vector FX.

Fundamental symbols

=	equals; is equal to
≠	is not equal to; does not equal
≡	is identical with; is always equal to
≅ ; ≈	is approximately equal to; approximately equals
>	is greater than
<	is less than
≤	is less than or equal; to is not greater than
≥	is greater than or equal to; is not less than
!	factorial (a! – *a* factorial; factorial *a*)
~ ; ∝	is (directly) proportional to
m_a	*ma*; *m* sub (script) *a*
x_{ij}	*x* ij; *x* with the indices ij
x'	*x* prime; *x* dashed
x''	*x* double-prime; *x* double-dashed

x*	*x* star
ā	*a* bar
ã	*a* tilde
â	*a* hat; *a* roof
ä	*a* double dot
| a |	the absolute value of *a*
%	per cent
∞	infinity
( )	parentheses, round brackets
[ ]	brackets, square brackets
{ }	braces

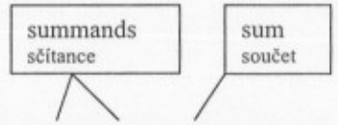
Mathematical Logic

X ∧ Y	X and Y (conjunction of statements X and Y).
X ∨ Y	X or Y (alternative of statements X and Y).
X ⇒ Y	X implies Y (implication). Y follows from X. if X holds then Y also holds. X is the sufficient condition for Y. Y is the necessary condition for X.
X ⇔ Y	X is equivalent to Y (equivalence). X holds if and only Y holds. X is the necessary and sufficient condition for Y.
∀	for all. The universal quantifier ($\forall x \in I : V(x)$ – for each $x \in I$ the statement $V(x)$ holds).
∃	there exists. The existential quantifier ($\exists x \in I : V(x)$ – there exists $x \in I$ such that the statement $V(x)$ holds.

Sets

x ∈ A	*x* is an element of *A*. *x* belongs to *A*. *x* is a member of *A*.
x ∉ A	*x* is not an element of *A*. *x* does not belong to *A*. *x* is not a member of *A*.
A = {a,b,c}	*A* is the set with the elements *a, b, c*.
A ⊂ B	*A* is included in *B*. *A* is contained in *B*. *A* is a (proper) subset of *B*.
A = ∅	*A* is an empty set. *A* is a null set.
A ∪ B	The union of *A* and *B*; *A* union *B*.
A ∩ B	The intersection of *A* and *B*; *A* intersection *B*.
A ⊆ B	*A* is a subset of *B*.
A ~ B	*A* and *B* are equivalent to each other.
(*a, b*)	The open interval *a b*/ with the end points *a, b*.
[*a, b*]; ⟨*a,b*⟩	The closed interval *a b*.
(*a, b*]; (*a,b*⟩	Half-open/ semi-open interval *a b*, open on the left and closed on the right.
X = (− ∞, + ∞)	Capital *X* equals the open interval minus infinity, plus infinity.

Addition

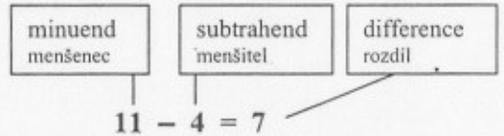


4 + 7 = 11

Four plus seven equals eleven.
Four plus seven is equal to eleven.
Four added to seven makes eleven.
Four and seven is/ are eleven.
Eleven is the sum of four and seven.
(or almost any combination of these, e.g.: Four and seven equals eleven.)

a + b = c	*a* plus *b* equals *c*.
$a_1 + a_2 = s$	*a* one plus *a* two equals *s*.

Subtraction

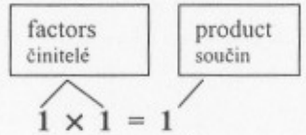


11 − 4 = 7

Eleven minus four equals seven.
Four from eleven leaves seven.
Eleven diminished by four is equal to seven.
Seven is the difference of eleven and four.

a − b = c	*a* minus *b* equals *c*.

Multiplication

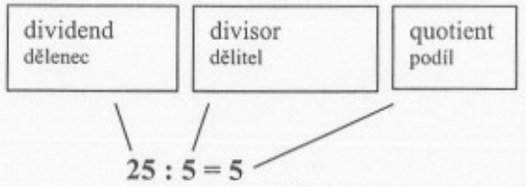


1 × 1 = 1

One times one is one.
Once one is one.

2 × 2 = 4	Twice two is four.
3 × 3 = 9	Three threes are nine. Three times three is nine.
4 . 4 = 16	Four (multiplied) by four equals sixteen.
ab = c	*ab* equals/ is equal to *c*. *a* multiplied by *b* equals *c*.

Division

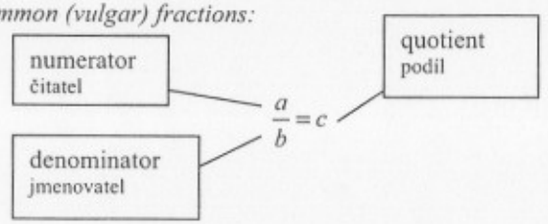


Twenty-five divided by five equals five.

$a \div b = c$ *a* divided by *b* equals *c*.

Fractions

Common (vulgar) fractions:



$\frac{1}{2}$ One half (a half).

1/3 One third (a third).

2/9 Two ninths.

$4\frac{5}{8}$ Four and five eighths.

$\frac{a}{b}$ *a* over *b*.

$\frac{a+b}{a-b} = \frac{c+d}{c-d}$ *a* plus *b* over *a* minus *b* equals *c* plus *d* over *c* minus *d*.

(You should avoid saying this except where it was visible to the listener: if you had to say it "unseen", you should pause to avoid ambiguity. – *a* plus *b* over (*pause*) *a* minus *b* equals *c* plus *d* over (*pause*) *c* minus *d*.

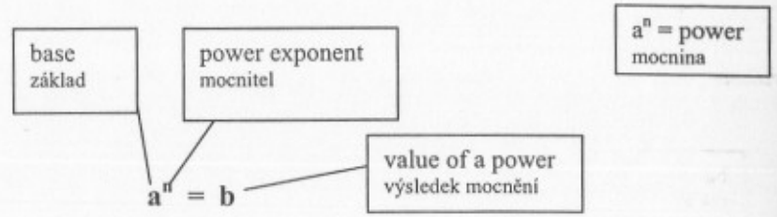
Decimal fractions:

0.523 Nought point five two three.
Zero point five two three.
Point five two three.
O [əu] point five two three.

23.25 Twenty-three point two five.

0.002 0 point 00 two.
Point two oes two.
Point double-o-two.
Point nought nought two.

Powers



a to the *n*th equals *b*.
a to the *n*th (or *n*-th) power is equal to *b*.
a (raised) to the power of *n* is equal to *b*.
The *n*th power of *a* is equal to *b*.

3^2 Three squared (square).
Three (raised) to the second power.
Three to the power two.
The second power of three.

5^3 Five cubed (cube).
The cube of five.
Five (raised) to the third power.
Five to the power three.
The third power of five.

10^7 Ten to the seven.
Ten to the seventh power.

10^{-7} Ten to the minus seven.

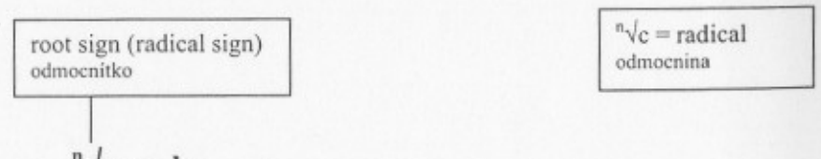
a^{-10} *a* to the minus tenth; to the power minus ten.

a^2 *a* squared; the square of *a*.

a^n *a* to the (power) *n* ; to the *n*th (power); the *n*th power of *a*.

$(x + y)^2$ *x* plus *y* all squared.

Roots



(The) *n*th root of *c* is equal to *b*.

$\sqrt{4} = 2$ The (square) root (of) four is two.

$\sqrt{a}$ Root *a*; the square root *a*; the square root of *a*.

$\sqrt[3]{a}$ The cube root (of) *a*.

$\sqrt[4]{16}$ The fourth root (of) sixteen.

$\sqrt[5]{a^7}$ The fifth root out of *a* to the power seven.

$\sqrt[n]{a}$ The nth root of a.

$\sqrt[n]{c^m}$ The nth root of c to the mth.

Logarithms

$\log_b c = n$

base
základ

$\log_b c$ = logarithmic expression
logaritmický výraz

The logarithm to the base b of c is equal to n.
The logarithm (of) c to/ with the base b is equal to n.

ln c The natural logarithm of c.
log c; lg c The (common) logarithm of c; log-ten c.
$\log_2$ a The logarithm (of) a to the base two.
$\log x_1 x_2$ The logarithm (of) x one x two.
$\log x^n$ The logarithm (of) x to the power n.

Calculus

$x \to x_0$ x approaches x nought
x tends to x nought

$\lim_{x \to x_1} f(x) = L$ As x tends to one, f of x tends to L.

The limit of f of x as x tends to x one is capital L.

$\lim_{a \to \infty} a_n = 0$ The limit of a sub n is zero as a tends to/ approaches infinity.

$\sum_{i=1}^{n}$ The sum from i equals one to n.

$y = \sum_{k=0}^{4} a_k x^k$ y equals the sum of a (sub) k, x to the power of k, (taken) from (or over)

(k equal to) zero to (k equal to) four.

$\int$ The (indefinite) integral.

$\iint$ The double integral.

$\iiint$ The triple integral.

$\int_a^b$ The integral from a to b.

The (definite) integral between the values a and b.

$\int f(x)\,dx$ The integral of (small/ function) f of x d x.

d The differential.
d f The differential of function f.

$y = f(x)$ y is equal to f of x.
y is equal to fx.
y is equal to the function f of x.

$f'(x)$ f prime of x.
The (first) derivative of (function) f with respect to x.

$f''(x)$ f double-prime of x.
The second derivative of f with respect to x.

$f'''(x)$ f triple-prime of x.
f treble-dash x.
The third derivative of f with respect to x.

$f^{(4)}(x)$ f four of x.
The derivative of the fourth order of function f.
The fourth derivative of f with respect to x.

$\frac{\partial v}{\partial \theta}$ The partial derivative of v with respect to θ.

$\frac{\partial^2 v}{\partial \theta^2}$ d two v by d theta squared.

The second partial derivative of v with respect to θ.

Trigonometric functions

$y = \sin x$ y equals sine x; y equals the sine of x.
$y = \cos x$ y equals cos x; y equals the cosine of x.
$y = \tan x$ y equals tan x; y equals the tangent of x.
$y = \cot x$ y equals cot x. y equals the cotangent of x.
$y = \arcsin x$ y equals the inverse sine of x.
y equals the arc sine of x.
y equals the angle whose sine is x.

Equations

$x + 7 = 3 - x$ a linear equation
x unknown
$x = 5$ the solution/ the root of the equation
$ax^2 + bx + c = 0$ a quadratic equation; the standard form of the quadratic equation
$D = b^2 - 4ac$ a discriminant
$ax^3 + bx^3 + cx + d = 0$ a cubic equation
$x + y = 2; 2x - y = 5$ a system of two (linear) equations
$x + 2 \geq 5 + 2x$ an inequality for the unknown x/ involving the unknown x
$\pi < 5$ an inequality