

# How to Read Figures, Mathematical Expressions and Equations, and Glossary

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## 目次

<b>1</b>	<b>英数字数式の読み方 (How to read equations)</b>	<b>1</b>
1.1	数 (numbers) . . . . .	1
1.2	年号, 時間 (他) (years, time, etc.) . . . . .	2
1.3	分数 (fractions) . . . . .	2
1.4	添え字 (suffices), 累乗 (powers, roots) . . . . .	3
1.5	加法・減法・乗法・除法 (他) (addition, subtraction, multiplication, division, etc.)	4
1.6	ベクトル, 行列, 関数 (vectors, matrices, functions) . . . . .	5
1.7	微分, 積分, 総和 (derivatives, differentials, integrals, sums) . . . . .	7
1.8	等式, 不等式 (equations, inequality) . . . . .	7
<b>2</b>	<b>Glossary</b>	<b>10</b>
2.1	Basic terms . . . . .	10
2.2	ベクトル解析 (vector analysis) . . . . .	12
2.3	単位 (units) . . . . .	12
2.4	化学式 . . . . .	13
2.5	ラテン語 . . . . .	13
2.6	ギリシャ文字 (Greek alphabet) . . . . .	13
2.7	Professions . . . . .	14
2.8	Physics . . . . .	15
	<b>参考文献</b>	<b>19</b>

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本小冊子は上智大学理工学部の科学技術英語の授業で用いるものである。  
発音を含んだ教材については, <http://ese.cc.sophia.ac.jp> を参照されたい。



## 表記 (Notations)

/ 同じ意味

( ) 付け加えてもよい

[ ] 言い換え可能

大文字 アクセントのある音節を強調

## 1 英数字数式の読み方 (How to read equations)

## 1.1 数 (numbers)

 $[100]$  a  $[one]$  hundred (one, a を忘れないこと) $[10,000]$  ten thousand $[628,000]$  six hundred and twenty-eight thousand $[12,000,000]$  twelve million $[2,000,000,000]$  two billion $[2,000,000,000,000]$  two trillion $[3.55]$  three point five five $[0.32]$  zero point three two $[0.333\cdots]$  zero point three recurring $[0.35848484\cdots]$  zero point three five eighty-four recurring $[20 - 30]$  twenty to thirty $[4 \times 10^5]$  four times ten to the fifth/  
four times ten to the fifth power/  
four times ten to the power of five $[6.5 \times 10^{-3}]$  six point five times ten to the minus three $[\infty]$  infinity

## 1.2 年号, 時間 (他) (years, time, etc.)

 $\boxed{1995}$  nineteen ninety-five $\boxed{1800}$  eighteen hundred $\boxed{2000}$  two thousand $\boxed{2006}$  two thousand six/twenty oh six $\boxed{7:00 \text{ a.m.}}$  seven am/ seven in the morning<sup>1</sup> $\boxed{2:30}$  two thirty/ half past two/ two half (Br.) $\boxed{10:18}$  ten eighteen/ eighteen past (after) ten $\boxed{9:45}$  nine forty-five/ a quarter to (of) ten $\boxed{\$35.80}$  thirty-five dollars and eighty cents $\boxed{1 \text{ cent}}$  a penny $\boxed{5 \text{ cents}}$  a nickel $\boxed{10 \text{ cents}}$  a dime $\boxed{25 \text{ cents}}$  a quarter

## 1.3 分数 (fractions)

 $\boxed{a/b}$  *a* over *b* $\boxed{ab/cd}$  *a* times *b* over *c* times *d* $\boxed{1/n}$  one *n*th/ one over *n* $\boxed{1/2}$  one half/one-half/a half $\boxed{1/3}$  one third/one-third/a third $\boxed{1/4}$  one quarter/one-quarter/a quarter $\boxed{3/4}$  three quarters/three-quarters $\boxed{1/5}$  one fifth/one-fifth/a fifth

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<sup>1</sup>o'clock はつかない

$\frac{2}{3}$  two-thirds

$\frac{4}{3}$  four over three/four thirds/four-thirds

$\frac{1}{10}$  one tenth/a tenth/one-tenth

$\frac{3}{7}$  three sevenths/three-sevenths

$\frac{112}{303}$  a [one] hundred (and) twelve over three hundred (and) three

$5\frac{2}{5}$  five (and) two-fifths

$\frac{21}{311}$  twenty-one over three hundred (and) eleven

#### 1.4 添え字 (suffices), 累乗 (powers, roots)

$-x$  minus [negative]  $x$

$x'$   $x$  prime<sup>2</sup>

$\bar{x}$   $x$  bar

$\hat{x}$   $x$  hat/  $x$  wedge

$x_i$   $x$  sub  $i$

$x^i$   $x$  super  $i$

$7^2$  seven squared

$5^3$  five cubed / five to the third power

$x^2$   $x$  squared

$x^3$   $x$  cubed/  $x$  to the third power

$x^n$   $x$  to the  $n$ th power/  $x$  to the  $n$ th/  $x$  to the power  $n$ /  $x$  to the  $n$

$x^{-n}$   $x$  to the minus  $n$ th power/  $x$  to the power minus  $n$ /  $x$  to the minus  $n$

$x^{1/2}$   $x$  to (the) half power/ the square root of  $x$

$x^{1/3}$  the cube root of  $x$

$x^{1/n}$  the  $n$ th root of  $x$

<sup>2</sup> $x$  dash とも言うが, dash は-の意味もある。



$\sqrt{2}$  the square root of two

$\sqrt[3]{2}$  the cube root of two

$\sqrt[n]{x}$  the  $n$ th root of  $x$

$\sqrt{x+y}$  the square root of the sum of  $x$  plus  $y$

### 1.5 加法・減法・乗法・除法 (他) (addition, subtraction, multiplication, division, etc.)

$x - y$   $x$  minus  $y$

$x + y$   $x$  plus  $y$

$x \pm y$   $x$  plus minus  $y$  /  $x$  plus or minus  $y$

$x \mp y$   $x$  minus or plus  $y$

$xy, x \times y$   $x$  times  $y$  /  $x$  multiplied by  $y$

$x \cdot y$   $x$  dot  $y$

$x \div y$   $x$  divided by  $y$

$x/y$   $x$  over  $y$

$x : y$  the ratio of  $x$  to  $y$

$n!$   $n$  factorial / factorial  $n$

$\binom{n}{a}$  binomial  $n$  over  $a$  / binominal coefficient  $n$  over  $a$

$1 \cdots 5$  one to five

$1 + 3 + 5 + \cdots$  one plus three plus five dot dot dot

$x(y+z)$   $x$  times the sum of  $y$  plus  $z$  /  $x$  open parenthesis  $y$  plus  $z$  close parenthesis<sup>3</sup>

$(x+y)z$  open parenthesis  $x$  plus  $y$  close parenthesis multiplied by  $z$  /  
(initial) parenthesis  $x$  plus  $y$  (final) parenthesis multiplied by  $z$ <sup>3</sup>

<sup>3</sup>イギリス英語では parenthesis でなく bracket を用いる。なお，括弧という場合は parentheses, brackets と複数形にする。



$[x]$   $x$  in brackets

$\frac{1}{2}\{x[y+(z-w)]\}$  one half times open brace  $x$  open bracket  $y$  plus open parenthesis  $z$  minus  $w$  close parenthesis close bracket close brace

$x'y''$   $x$  prime times  $y$  double prime/  $x$  prime times  $y$  second prime

$|z|$  modulus of  $z$ / absolute value of  $z$

$\sphericalangle A$  angle  $A$

$\perp A$  right angle  $A$

## 1.6 ベクトル, 行列, 関数 ( vectors, matrices, functions)

$\vec{x}, \mathbf{x}$  vector  $x$

$\mathbf{x} \cdot \mathbf{y}$   $x$  dot  $y$ <sup>4</sup>

$\mathbf{x} \times \mathbf{y}$   $x$  cross  $y$ <sup>4</sup>

$\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$  matrix with the diagonal  $a$  sub one one to  $a$  sub three three

$\det A$  determinant  $A$

$f(x)$  function of  $x$ /  $f$  of  $x$

$f^{-1}(x)$  inverse of the function  $f$  of  $x$ /  
 $f$  of  $x$  to the power minus one

$\exp(x)$   $e$  to the  $x$ th power/  $e$  to the power  $x$

$\exp(ix)$   $e$  to the power  $ix$

$\ln x$  the natural log of  $x$

$\log x$  the log of  $x$

$\log_{10} x$  the common log of  $x$

$\log_2 x$  the binary log of  $x$ / the log of  $x$  to the base two

<sup>4</sup> 内積は dot [scalar, inner] product, 外積は cross [vector, outer] product. Outer product は外積以外の意味に使われることもあるので注意。



$\lim_{x \rightarrow \infty} f(x)$  the limit of the function  $f$  of  $x$  as  $x$  goes to [approaches] infinity

$\sin x$  sine  $x$

$\cos x$  cosine  $x$

$\tan x$  tangent  $x$

$\operatorname{cosec} x$  cosecant  $x$

$\sec x$  secant  $x$

$\cot x, \operatorname{ctg} x, \operatorname{ctn} x$  cotangent  $x$

$\sinh x$  sinch  $x$  / shine  $x$  / hyperbolic sine  $x$

$\cosh x$  kosh  $x$  / hyperbolic cosine  $x$

$\tanh x$  than  $x$  / tanch  $x$  / hyperbolic tangent  $x$

$\operatorname{cosech} x$  kosetch  $x$  / hyperbolic cosecant  $x$

$\operatorname{sech} x$  setch  $x$  / hyperbolic secant  $x$

$\operatorname{coth} x$  koth  $x$  / hyperbolic cotangent  $x$

$\arcsin x$  arc sine  $x$  / the angle whose sine is  $x$

$\arccos x$  arc cosine  $x$  / the angle whose cosine is  $x$

$\arctan x$  arc tan  $x$  / the angle whose tangent is  $x$

$\operatorname{arccosec} x$  arc cosec  $x$  / the angle whose cosecant is  $x$

$\operatorname{arcsec} x$  arc sec  $x$  / the angle whose secant is  $x$

$\operatorname{arccot} x, \operatorname{arcctn} x$  arc cot  $x$  / the angle whose cotangent is  $x$

$\cos^{-1} x$  inverse cosine  $x$  / cos minus one  $x$

$\sin^{-1} x$  inverse sine  $x$  / sine minus one  $x$

$\tan^{-1} x$  inverse tangent  $x$  / tangent minus one  $x$

$\cot^{-1} x$  inverse cotangent  $x$  / cotangent minus one  $x$

$\sec^{-1} x$  inverse secant  $x$  / secant minus one  $x$

$\cosh^{-1} x$  inverse kosh  $x$  / inverse hyperbolic cosine  $x$  / kosh minus one  $x$

$\sinh^{-1} x$  inverse shine  $x$  / inverse hyperbolic sine  $x$  / shine minus one  $x$



$\boxed{\tanh^{-1} x}$  inverse than  $x$ / inverse hyperbolic tangent  $x$ / than minus one  $x$

$\boxed{\operatorname{sech}^{-1} x}$  inverse setch  $x$ / inverse hyperbolic secant  $x$ / setch minus one  $x$

### 1.7 微分, 積分, 総和 (derivatives, differentials, integrals, sums)

$\boxed{\Delta f}$  delta  $f$ / finite difference of  $f$

$\boxed{dx}$  differential of  $x$

$\boxed{\frac{df}{dx}}$  d  $f$  d  $x$

$\boxed{\frac{df(x)}{dx}}$  d  $f$  of  $x$  d  $x$

$\boxed{\frac{\partial f}{\partial x}}$  dif  $f$  to dif  $x$ / the partial derivative of  $f$  with respect to  $x$ / round  $f$  round  $x$

$\boxed{D_x f}$  D sub  $x$  of  $f$ / the derivative of  $f$  with respect to  $x$

$\boxed{\delta f(x)}$  small difference in the function  $f$  of  $x$

$\boxed{\int_a^b f(x) dx}$  the integral from  $a$  to  $b$  of  $f$  of  $x$  with respect to  $x$

$\boxed{\iint}$  double integral

$\boxed{\iiint}$  triple integral

$\boxed{\oint}$  circuital integral / integral round a closed circuit

$\boxed{\sum_{i=1}^n a_i}$  the sum from  $i$  equals one to  $n$  of  $a$  sub  $i$ /  
the sum of all terms of  $a$  sub  $i$  from  $i$  equals one to  $i$  equals  $n$

$\boxed{\prod_{i=1}^n a_i}$  the product from  $i$  equals one to  $n$  of  $a$  sub  $i$ /  
the product of all terms of  $a$  sub  $i$  from  $i$  equals one to  $i$  equals  $n$

### 1.8 等式, 不等式 (equations, inequality)

$\boxed{20 + 12 = 32}$  Twenty plus twelve equals thirty-two.

$\boxed{50 - 16 = 34}$  Fifty minus sixteen equals thirty-four.

$\boxed{7 \times 5 = 35}$  Seven times five is [equals, is equal to] thirty-five.





$15 \div 5 = 3$  Fifteen divided by five equals three.

$18/2 = 9$  Eighteen over two is nine.

$10/20 = 1/2$  Ten-twentieths is reduced to one half [one-half].

$31 \div 7 = 4 \text{ r } 3$  Thirty-one divided by seven is four with a remainder of three.

$4.1 - 8.3 = -4.2$  Four point one minus eight point three equals minus [negative] four point two.

$2^2 = 4$  Two squared is four.

$2^3 = 8$  Two cubed is eight.

$2 : 3 = 4 : 6$  Two is to three as four is to six.

$x = y$   $x$  equals  $y$ . /  $x$  is equal to  $y$ .

$x \parallel y$   $x$  is parallel to  $y$ .

$\therefore x = y$  Therefore  $x$  equals  $y$ .

$\because x = y$  ....., since  $x$  equals  $y$ .

$x : y = z : w$   $x$  is to  $y$  as  $z$  is to  $w$ .

$3x + 2x = 5x$  Three  $x$  plus two  $x$  equals five  $x$ .

$y = -5x^2 + 2x + 4$   $y$  equals minus [negative] five  $x$  squared plus two  $x$  plus four.

$(x + y)^2 = x^2 + 2xy + y^2$

The quantity  $x$  plus  $y$  squared is  $x$  squared plus two  $xy$  plus  $y$  squared.<sup>5/</sup>

Open parenthesis  $x$  plus  $y$  close parenthesis squared is  $x$  squared plus two  $xy$  plus  $y$  squared.<sup>3</sup>

$(x + y)(x - y) = x^2 - y^2$

The quantity  $x$  plus  $y$  times the quantity  $x$  minus  $y$  equals  $x$  squared minus  $y$  squared.<sup>6</sup>

Open parenthesis  $x$  plus  $y$  close parenthesis, open parenthesis  $x$  minus  $y$  close parenthesis, is equal to  $x$  squared minus  $y$  squared.<sup>3</sup>

$x^2 + y^2 = z^2$

$x$  squared plus  $y$  squared equals  $z$  squared.<sup>7</sup>

<sup>5</sup>quantity  $x$  plus  $y$  のあと , 一呼吸おく。

<sup>6</sup>quantity  $x$  plus [minus]  $y$  のあと , 一呼吸おく。

<sup>7</sup>ピタゴラスの定理, Pythagoran proposition [theorem]



$$\boxed{x^3 + y^3 = z^3}$$

$x$  cubed plus  $y$  cubed equals  $z$  cubed.<sup>8</sup>

$$\boxed{y = f(x)}$$
  $y$  equals  $f$  of  $x$ .

$$\boxed{x \neq y}$$
  $x$  is not equal to  $y$ .

$$\boxed{x > y}$$
  $x$  is greater [more] than  $y$ .

$$\boxed{x < y}$$
  $a$  is less [smaller] than  $b$ .

$$\boxed{x \geq y}$$
  $x$  is greater [more] than or equal to  $y$ ./  $x$  is equal to  $y$  or greater [more].

$$\boxed{x \leq y}$$
  $x$  is less [smaller] than or equal to  $y$ ./  $x$  is equal to  $y$  or less [smaller].

$$\boxed{x \gg y}$$
  $x$  is much greater than  $y$ .

$$\boxed{x \ll y}$$
  $x$  is much less [smaller] than  $y$ .

$$\boxed{x + y > z}$$
  $x$  plus  $y$  is greater than  $z$ .

$$\boxed{2x + y \leq z}$$
 Two  $x$  plus  $y$  is less than or equal to  $z$ ./ Two  $x$  plus  $y$  is equal to  $z$  or less.

$$\boxed{x \rightarrow y}$$
  $x$  tends to  $y$ ./  $x$  approaches  $y$ .

$$\boxed{x \approx y}$$
  $x$  is nearly equal to  $y$ ./  $x$  is approximately equal to  $y$ .

$$\boxed{x \equiv y}$$
  $x$  is identical with [to]  $y$ .

$$\boxed{x \not\equiv y}$$
  $x$  is not identical with [to]  $y$ .

$$\boxed{x \perp y}$$
  $x$  is perpendicular to  $y$ .

$$\boxed{x \parallel y}$$
  $x$  is parallel to  $y$ .

$$\boxed{x \sim y}$$
  $x$  is asymptotic to  $y$ .

$$\boxed{x \propto y}$$
  $x$  is proportional to  $y$ ./  $x$  is in proportion to  $y$ .

$$\boxed{x \propto 1/y}$$
  $x$  varies inversely with  $y$ ./  $x$  is inversely proportional to  $y$ .

$$\boxed{\angle A = \angle B}$$
 Capital  $a$  has the same angle as capital  $b$ ./ The angle  $A$  is equal to the angle  $B$ .

$$\boxed{ABC \equiv DEF}$$
 All capital  $abc$  coincides with all capital  $def$ .

<sup>8</sup>cf. フェルマーの最終定理, Fermat's last theorem



## 2 Glossary

### 2.1 Basic terms

足す plus

引く minus

かける times, MULtiplied by

わる over, deVIDed by

公理 AXiom

定義 defiNtition

定理 THEorem

系 CORollary

証明 proof

代数 ALgebra

幾何 geOMetry

解析 aNALysis

整数 INteger, INtegral NUMBER

素数 prime NUMBER

自然数 CARdinal NUMBER

序数 ORdinal NUMBER

偶数 Even NUMBER

奇数 odd NUMBER

最大公約数 greatest COMmon diVisor

最小公倍数 least COMmon MULTiple

因数 FACTor

素因数 prime FACTor

因数分解 factoriZAtion

素因数分解 factoriZAtion in prime NUMbers

小数 DECimal

分数 FRACtion

分母 deNOMinator

分子 NUmerator

四捨五入 round off

切り上げ round up

切り捨て round down

実数 REal NUMBER

虚数 iMAGinary NUMBER

複素数 comPLEX NUMBER/  
COMplex NUMBER

比例 proPORTion

Ex.) A is proPORTional to B./  
A is in proPORTion to B.

正比例 diRECT proPORTion

反比例 INverse proPORTion

Ex.) A is INversely proPORTional to B.

等式 eQUAtion

1 次方程式 SIMple eQUAtion

線形方程式 LINear eQUAtion

2 次方程式 quaDRAtic eQUAtion

3 次方程式 CUbic eQUAtion

$n$  次方程式  $n$ th-deGREE eQUAtion



微分方程式 differENtial eQUAtion

偏微分方程式 PARtial differENtial eQUAtion

連立方程式 simulTANeous eQUAtion

関数 FUNcTION

1 次関数 LInear FUNcTION

2 次関数 quaDRATic FUNcTION

微分 differENtial

微分法 differentiAtion

導関数 deRIVative

積分 INtegral

積分法 inteGRAtion

合同 conGRUence/ conGRUent /CONgru-  
ence/CONgruent

相似 simiLARity/ SIMilar

対称 SYMmetry

横幅 width

高さ height

奥行き depth

長さ length

重さ weight

面積 ARea

体積 VOLume

底辺 base

頂点 VERtex

面 face

側面 LATeral face

辺 (三角形) side

円 circle

楕円 eLIPSE / Oval

半径 RAdius

直径 diAMeter

三角形 TRIAngle

直角三角形の辺 leg/ hyPOTenuse

二等辺三角形 iSOSceles TRIangle

直角三角形 right TRIangle

正三角形 equiLateral TRIangle

不等辺三角形 scaLENE [SCAlene] TRIangle

四辺形, 四角形 quadriLateral, QUADrangle  
(米), quadRANgle(英)

平行四辺形 paralLELogram

台形 TRAPezoid

不等辺四辺形 traPEzium<sup>9</sup>

正方形 square

長方形 REcTangle

菱形 RHOMbus

五角形 PENtagon

六角形 HEXagon

八角形 OCtagon

多角形 POLygon

<sup>9</sup>イギリス英語では trapezoid が不等辺四角形, trapezium が台形



凸多角形 conVEX POLygon

凹多角形 conCAVE POLygon

角柱 prism

角錐 PYRamid

円柱 CYLinder

円錐 cone

## 2.2 ベクトル解析 (vector analysis)

$\nabla V, \text{grad}V$  NABla CAPital  $V$  /  
GRADient CAPital  $V$

$\nabla \cdot \vec{E}, \text{div}\vec{E}$  diVERgence of VECtor field  
CAPital  $E$

$\nabla \times \vec{E}, \text{rot}\vec{E}$  roTATION of VECtor field  
CAPital  $E$

$\Delta V$  LaPLACian CAPital  $V$

## 2.3 単位 (units)

53 grams, 2 centimeters のように複数形をとる。しかし, gs, cms のようにはせず, g, cm のままでよく, ピリオドもいらない。

$\text{m}$  MEter

$\text{cm}$  CENTImeter

$\text{cm}^{-1}$  reCIProcal CENTImeter/  
per CENTImeter

$\text{mol}^{-1}$  per mole (発音は mouL と長母音)

$\text{s}$  SECond

$\text{g}$  gram

$\text{kg}$  KILOGram

$\text{N}$  NEWton

$\text{J}$  joule

$\text{erg}$  erg

$\text{A}$  AMPere

$\text{C}$  COULomb

$\Omega$  ohm (発音は oum)

$\text{S}$  SIEmens

$\text{T}$  TESla

$\text{Pa}$  pasCAL

$\text{Wb}$  WEber

$\text{K}$  KELvin

$^{\circ}$  deGREE CENTigrade/  
deGREE CELsius<sup>10</sup>

$\text{M}$  MEGa-  $10^6$

$\text{G}$  GIGa-  $10^9$

$\text{T}$  TERa-  $10^{12}$

$\text{P}$  PETa-  $10^{15}$

$\text{E}$  EXa-  $10^{18}$

$\text{Z}$  ZETta-  $10^{21}$

$\text{m}$  MILli-  $10^{-3}$

$\mu$  Micro-  $10^{-6}$

$\text{n}$  NANO-  $10^{-9}$

$\text{p}$  PIco-  $10^{-12}$

$\text{f}$  FEMto-  $10^{-15}$

$\text{a}$  ATto-  $10^{-18}$

$\text{z}$  ZEPTo-  $10^{-21}$

<sup>10</sup>華氏は FAHrenheit, 摂氏 = (華氏 - 32) \* 5/9



## 2.4 化学式

$\text{C}_6\text{H}_5\text{OH}$  C six H five OH / PHEnol

$\text{H}_2\text{C}_2\text{O}_4$  H two C two O four / oxALic ACid

$^{13}\text{C}$  CARbon thirTEEN

$^3\text{H}$  TRItium

## 2.5 ラテン語

科学論文に出てくる主なラテン語を列記する。すべて省略形である<sup>11</sup>。原則として斜体，頻繁に使われ英語として用いられるようになったものは立体 ([http://wwwsoc.nii.ac.jp/jps/jpsj/jshiori/etc/writing\\_memo.html](http://wwwsoc.nii.ac.jp/jps/jpsj/jshiori/etc/writing_memo.html))

$\text{ca.}$  about (CIRca)

$\text{cf.}$  conFER

$\text{e.g.}$  for exAMple (exEMpli GRAtia)

$\text{et al.}$  and OTHers (et ALii )

$\text{in situ}$  in place

$\text{etc.}$  et CETera

$\text{ibid.}$  in the same place (Ibidem)

$\text{i.e.}$  that is (id est)

$\text{vs.}$  VERsus

## 2.6 ギリシャ文字 (Greek alphabet)

$\text{A, } \alpha$  ALpha

$\text{B, } \beta$  BEta

$\text{X, } \chi$  chi

$\Delta, \delta$  DELta

$\text{E, } \epsilon, \varepsilon$  EPsilon

$\Phi, \phi, \varphi$  phi

$\Gamma, \gamma$  GAMma

$\text{H, } \eta$  Eta

$\text{I, } \iota$  iOta

$\text{K, } \kappa$  KAPpa

$\Lambda, \lambda$  LAMBda

$\text{M, } \mu$  mu

$\text{N, } \nu$  nu

$\text{O, } \omicron$  OMicron/omIcron

$\text{II, } \pi$  pi

$\Theta, \theta, \vartheta$  THEta

$\text{P, } \rho$  rho

$\Sigma, \sigma$  SIGma

$\text{T, } \tau$  tau

$\text{Y, } \upsilon$  UPsilon

$\Omega, \omega$  oMEga

$\Xi, \xi$  xi

$\Psi, \psi$  psi

$\text{Z, } \zeta$  ZEta

<sup>11</sup>省略は一般には abbreviation, そのうち頭文字を取って作ったのは acronym



## 2.7 Professions

科学者 SCientist

技術者 engiNEER

数学者 mathemaTician

物理学者 PHYsicist (phySIcian は内科医)

天文学者 asTRONomer (AStronaut は宇宙飛行士)

化学者 CHEMist

生物学者 biOLOGist

動(植物)学者 zoOLOGist (BOTanist)

機械工学者 meCHANical engiNEER

電気工学者 eLECTrical engiNEER



## 2.8 Physics

### geOMetry

RAdius  
diAMeter  
ORbit  
VERTical  
perpenDICular  
PARallel  
horiZONtal  
cirCUMference  
DISTance  
plane  
slope  
eCLIPSE  
spring [VERnal] Equinox  
SUMmer SOLstice  
periHELion  
aPHELion  
leap year  
half moon  
QUARter moon  
full moon  
CREScent  
new moon

### meCHANics

PRINciple  
law  
rule  
ARistotle  
AristoTElian  
PLAto  
PlaTONic  
NEWton  
CoPERnicus  
GaliLEO  
NEWton's first law of MO-  
tion  
force  
net force

reSULTant  
FRICtion  
resisTIVity  
visCOSity  
speed  
veLOCity  
accelerAtion  
SCAlar  
VECTor  
mass  
inERTia  
meCHANical equiLiBrium  
free fall  
moMEntum  
IMpulse  
bounce  
conserVAtion law  
(of moMEntum, ENergy,  
mass)  
ACtion and reACtion force  
colLIision  
head-on colLIision  
eLAsTic colLIision  
ineLAsTic colLIision  
kiNETics, meCHANics  
ENergy  
poTENTial ENergy  
graviTAtional ENergy  
kiNETic ENergy  
meCHANical ENergy  
effiCiency  
work, POWer, force  
LEVer  
roTAtion  
roTAtional MOTion  
CIRcular MOTion  
torque  
CENter of mass  
CENter of GRAVity

CENtral force  
cenTRIPetal force  
cenTRIFugal force  
MOment of inERTia  
roTAtional inERTia  
GRAVity  
graviTAtional force  
graviTAtional CONstant  
Universe  
COSmos  
uniVERsal  
INverse [inVERse] square  
law  
Ocean tides  
spring tides, neap tides,  
high tides, low tides  
black hole  
EINstein  
HAWking  
graviTAtional field  
weight, mass, inERTia  
the Sun  
MERcury  
VENus  
Earth  
Mars  
JUperiter  
SATurn  
URAnus, Uranus  
NEPtune  
PLUto

### periODic Table

group  
PERiod  
METalloid: H, B, Si, Ge, As, Sb,  
Te  
non-METal: He, C, N, O, F, Ne,  
P, S, Cl, Ar, Se, Br, Kr, I, Xe





METal: Na, Mg, Al, etc.	Zn: zinc	atmoSPHERic PRESsure
H: HYdrogen	Ga: GALlium	baROMeter
He: HELium	Ge: gerMANium	Boyle's law
Li: LITHium	As: ARsenic (形容詞 ar- SENic)	PLASma
Be: beRYLLium	ARsenide	gas
B: BOron	Se: seLEnium	LIQuid
C: CARbon	Br: BROmine	SOLid
N: NITrogen	BROmide	TEMperature
O: OXYgen	Kr: KRYPTon	ABSolute ZERo
Oxide (CO <sub>2</sub> ; CARbon diOxide)	Rb: ruBIDIum	heat
F: FLUorine	Sr: STRONTium	inTERnal ENergy
Ne: NEon	Y: YTtrium	speCIFIC heat
Na: SOdium	Zr: zirCONium	conDUction
Mg: magNEsium	Nb: niOBium	conVEction
Al: aLUminum(米)/ aluMINium(英)	Mo: moLYBdenum	radiAtion
aLUmina	Tc: techNETium	SOLar CONstant
Si: SILicon	Ru: ruTHEnium	phase
P: PHOSphorus	Rh: RHODium	evapoRAtion
S: SULfur	Pd: palLADIum	sublimAtion
Cl: CHLORine	Ag: SILver	condenSAtion
CHLORide (NaCl, SOdium CHLORide)	Cd: CADmium	BOILING
Ar: ARgon	In: INdium	regeLAtion
K: poTASSium	Sn: tin	LAtent heat
Ca: CALcium	Sb: ANtimony	adiaBAtic PROCess
Sc: SCANDium	ANTimonide	heat ENgine
Ti: tiTANIum	Te: telLURIum	heat pump
V: vaNADIum	I: Iodine	ENTropy
VANadate (NaVO <sub>3</sub> , SOdium VANadate)	Iodide, NaI (SOdium Iodide)	the first (SECONd) law of thermodyNAMics
Cr: CHROMium	Xe: XENon	
Mn: MANganese(米)/ mangaNESE(英)	Pt: PLATInum	<b>sound and waves</b>
MANganite (LaMnO <sub>3</sub> LANthanum MANganite)	Au: gold	sine curve
Fe: Iron	Hg: MERcury	SINusoid, sinusOIDal
Co: CObalt	Pb: lead	AMplitude
Ni: NICKel	U: uRANIum	WAVElength
Cu: COPper	Pu: pluTONium	FREquency
		hertz
	<b>thermodyNAMics</b>	PERiod
	SURface TENsion	wave speed
	capilLARity	TRANSverse [transVERSE]



wave	CURrent DENsity	UMbra
longiTUDinal wave	MAGnetism	peNUMbra
interFERence PATtern	magNETic force	COLor
STANDing wave	magNETic flux DENsity	white
DOPPler effECT	magNETic field, eLECTric field	red
infraSONic	in a magNETic field	green
ultraSONic	in high magNETic fields <sup>12</sup>	blue
superSONic	Gauss, TESla	YELlow
comPRESSion	magNETic doMAINs	CYan
reverberAtion	magNETic doMAIN wall	maGENta
reFRACtion	MAGnet	PRImary COLors
FORced viBRAtion	electroMAGnet	three PRImary COLors
RESonance	magNETic pole	red, blue, and green
pitch	MONopole	ADditive PRImary COLors (加法混色の原色)
FOURier aNALysis	DIpole	compleMENtary COLors
	COSmic rays	subTRACTive PRImary COLors (maGENta, YELlow, and CYan)
<b>elecTRICity and MAG-</b>	LOrentz force	reFLEction
<b>netism</b>	electromagNETic inDUction	reFRACtion
electroSTATics	FARaday's law	FERmat's PRINciple of least time
elecTRICity	GENERator	law of reFLEction
conserVAtion of charge	COMmutator	Snell's law
conDUCTor	turboGENERator	diffUSE reFLEction
INsulator	MHD (magnetohydrodyNAMics)	CRITical angle
semiconDUCTor	transFORMer	TOTal inTERNal reFLEction
superconDUCTor	self-inDUction	conVERging lens
polarIZAtion	POWER transMISSion	conVEX lens
eLECTric field	POWER transMISSion line	diVERging lens
caPACity	MAXwell's eQUAtion	conCAVE lens
eLECTric CURrent		VIRtual IMAge
poTENTial DIFFerence	<b>light</b>	REal IMAge
VOLTage	VISible light	aberRAtion
eLECTrical reSISTance	infraRED (IR)	disPERsion
Ohm's law	ultraViolet (UV)	HUYgens' PRINciple
diRECT CURrent	electromagNETic wave	diffRACtion
ALternating CURrent	transPARent (maTERial)	interFERence
eLECTric POWER	oPAque	polarIZAtion
CIRcuit	electromagNETic SPECTrum	HOLogram
SEries CIRcuit	SHADow	
PARallel CIRcuit		

<sup>12</sup>under high magnetic field とも言うが、正確には under high magNETic field conDition



light eMISSION  
 exciTATION  
 eMISSION SPECTrum  
 SPECTroscope  
 incanDESCence  
 abSORPtion SPECTrum  
 fluoREScence  
 phosphoREScence  
 LASer

### QUANtum meCHANics

QUANtum, QUANta  
 QUANtum PHYSics  
 Planck's CONstant  
 photoeLECTric eFFECT  
 unCERTainty PRINCiple  
 complemenTArity  
 X-ray  
 ATom  
 MOLEcule  
 eLECTron  
 NUCleus, NUClei, NUCleon,  
 NUClear  
 PROton  
 NEUtron  
 quark (up, down, charm,

strange, top, BOTtom)  
 RAdioacTIVity  
 ALpha ray  
 BEta ray  
 GAMma ray  
 aTOMIC NUMber  
 Isotope  
 aTOMIC mass Unit (amu)  
 half-life  
 deCAY time  
 transmUTATION  
 NUClear FISsion  
 chain reACtion  
 CRITical mass  
 BREEDer reACTor  
 light-water reACTor  
 NUClear FUSion  
 thermoNUclear FUSion

### relaTIVity

SPEcial THEory of relaTIVity  
 frame of REFerence  
 simultaNEity  
 SPACEtime/SPACE-time  
 time diLAtion  
 length conTRACtion

GENeral THEory of relaTIVity  
 PRINCiple of eQUIValence  
 red shift  
 HUBble law  
 HUBble CONstant  
 graviTATIONAL red shift  
 graviTATIONAL wave  
 geoDESic

### Units

MEter  
 KILOgram  
 SECONd  
 AMPere  
 MKSA PRACTical unit  
 MKSA SYStem  
 CGS SYStem of units  
 CGS SYStem  
 NEWton  
 joule  
 KELvin  
 AREa  
 VOLume



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