CAMBRIDGE
Cambridge University Press & Assessment
978-1-009-09628-7 — Introduction to Proofs and Proof Strategies
Shay Fuchs
Index
More Information

INDEX

absolute value, 14
  basic properties, 14
analysis, 234
arcsine, 133
arithmetic mean, 9
Arithmetic-Geometric Mean Inequality, 9, 10
  for four numbers, 22
  for three numbers, 22
  general, 99, 126
arrangement, 207, 209
associativity, 44
average, 9
axiom, 43

Basic Facts (for inequalities), 7
Bernoulli's Inequality, 102
Bézout's Identity, 173
bijection, 128
binary representation, 118
binomial coefficients, 216
  symmetry, 216
Binomial Theorem, 215
bounded (function), *see* function

Cantor's Theorem, 149
cardinality, 128, 139, 140, 151
chairperson identity, 216
closure, 44
codomain, 36
combination, 211
combinatorics, 207
commutativity, 44
completeness axiom, 49
complex exponential function, 293
complex number, 266–268
  absolute value, 273
  argument, 285
  conjugate, 273
  imaginary part, 268
  modulus, 273
  polar representation, 285
  real part, 268
  roots, 288, 289
  square roots, 280, 281
complex plane, 276
complex polynomial equations, 292
composite number, 18
composition, *see* function
congruence modulo n, 196
conjunction, 69, 71
connective, 67, 68
continuity, 254, 255
  on intervals, 256
contradiction, *see* proof
contrapositive, 81
convergence, *see* limit
coprime, 168
counting numbers, 16
cubic equation, 266

De Moivre's Theorem, 288
De Morgan's Laws, 34
derangement, 229
derivative, 258
diagram
  arrow, 37
  bubble, 37

© in this web service Cambridge University Press & Assessment www.cambridge.org

CAMBRIDGE
Cambridge University Press & Assessment
978-1-009-09628-7 — Introduction to Proofs and Proof Strategies
Shay Fuchs
Index
More Information

differentiability, 254, 257
discriminant, 4
disjunction, 69, 71
distributivity, 44, 308
divisibility, 164
divisible by, 17
Division Algorithm, 164, 165
domain, 36

elementary statement, 73
end of proof symbol □, 5
equivalence, 69, 71
  class, 191
  relation, *see* relation
equivalent vectors, 331
Erdős–Szekeres Theorem, 230
Euclid's Lemma, 175
Euclidean Algorithm, 168–171
Euler's Identity, 295
even number, 18

factorial, 107
field
  axioms, 25, 43
  of complex numbers, 270
  of rational functions, 47
  ordered, 62
  with two elements, 47
function, 25, 35, 36
  as a relation, 186
  bijective, *see* bijection
  bounded, 58, 85
  composition, 135
  decreasing, 133
  graph of, 38
  image of, 36
  increasing, 133
  injective, *see* injection
  inverse, 129
  monotone, 133
  not properly defined, 52
  range of, 36
  surjective, *see* surjection
  unbounded, 85
  well-defined, 54

Fundamental Theorem of Algebra, 292
Fundamental Theorem of Arithmetic, 175, 177

GCD, *see* greatest common divisor
geometric mean, 9
graph (of a function), *see* function
greatest common divisor, 168

identity
  additive, 44
  multiplicative, 44
if and only if, 6
image
  of a function, *see* function
  of a set, 41
  of an element, 36
implication, 69, 71, 74
Inclusion-Exclusion Principle, 221, 225
induction, *see* mathematical induction
inequalities, 6
infinite intersections, 49
infinite unions, 49
injection, 128
integer numbers, 17, 26
Intermediate Value Theorem, 257
interval
  closed, 29
  notation, 29
  open, 29
inverse
  additive, 45
  multiplicative, 45
irrational numbers, 19
isomorphism, 325, 330

L-tiling, 111
LCM, *see* least common multiple
least common multiple, 181
limit
  at infinity, 262
  infinite, 262
  infinite (for sequences), 261
  of a function, 242, 248
  of a sequence, 234, 236
  one-sided, 250, 251

© in this web service Cambridge University Press & Assessment www.cambridge.org

CAMBRIDGE
Cambridge University Press & Assessment
978-1-009-09628-7 — Introduction to Proofs and Proof Strategies
Shay Fuchs
Index
More Information

linear algebra, 306
linear map, 325, 326
  image of, 327
  kernel (null space) of, 327
logic symbols, 70
logical equivalence, 77
logically equivalent statements, 79
  with quantifiers, 82

mathematical induction, 99
  strong, 115
  the principle of, 99, 100
  variations, 109

natural numbers, 16, 26
negation, 69, 71, 82
neighbourhood, 243
  punctured, 243

odd number, 18
order axioms, 49

Parallelogram Identity, 296
Parallelogram Law, 313
partition, 195
Pascal's Identity, 216
Pascal's Triangle, 215, 218
permutation, 207, 209, 210, 228
pi notation, *see* product notation
Pigeonhole Principle, 219
  generalized, 220
positive integers, 16
power set, *see* set
predicate, 68
prime number, 18, 164
  infinitely many, 91
product notation, 106
proof
  by contradiction, 88
  by contrapositive, 88
  direct, 87
  strategies, 86
proposition, 67

quadratic equation, 3
  complex, 280, 283
quadratic formula, 3
quantifier, 68, 76
  existential, 71
  universal, 71
quotient set, 195

$\mathbb{R}^2$, 32
$\mathbb{R}^n$, 306
range, *see* function
rational numbers, 18, 26
real number system, 19, 49
real numbers, 4, 19
recursion, 112
reflexivity, *see* relation
relation, 184, 185
  binary, 185
  equality, 190
  equivalence, 187
  reflexive, 187
  symmetric, 187
  transitive, 187
relatively prime, 168
remainder, 165
rough work, 11
Rule of Product, 208
Rule of Sum, 208, 221

scalar multiplication, 307, 308, 314
Schröder–Bernstein Theorem, 151, 152, 160
selection, 207, 211
  with repetitions, 212
set, 25
  complement, 30
  countable, 147
  element of, 25
  empty, 26
  identities, 34
  null, 26
  operations, 29
  power, 149
  uncountable, 147
  universal, 30
set-builder notation, 26
sets
  Cartesian product of, 30, 34
  difference of, 30

© in this web service Cambridge University Press & Assessment www.cambridge.org

CAMBRIDGE
Cambridge University Press & Assessment
978-1-009-09628-7 — Introduction to Proofs and Proof Strategies
Shay Fuchs
Index
More Information

sets (cont.)
  disjoint, 30
  intersection of, 30
  union of, 30
sigma notation, *see* summation notation
statement, 67
  compound, 70
  vacously true, 86
stick and stones, 212
subfield, 62
subset, 26
  of a finite set, 104
summation notation, 106
surjection, 128
symmetry, *see* relation

tip-to-tail rule, 314
transitivity, *see* relation
Triangle Inequality, 9, 13, 15
  for complex numbers, 276, 278
  general, 100, 103
  reverse, 22
truth table, 73, 77
  elementary, 77
truth value, 73
types of numbers, 16

variation, 209
vector
  addition (in $\mathbb{R}^n$), 307, 308
  addition (of geometric vectors), 313
  algebraic, 306
  coordinates, 306
  geometric, 309
  length, 331
  space, 317
  subspace, 321, 322
vector space
  sum, 325
Venn diagram, 30
Vieta's Formulas, 20

Weierstrass' First Theorem, 257
Weierstrass' Second Theorem, 257

© in this web service Cambridge University Press & Assessment www.cambridge.org