Index

A

Ambiguity:
  lexical, 54
  in quantified sentences, 48–50
  structural, 53–54
Ancestor, 207
Arbitrary names, 74–76
Argument:
  of a function, 147
  of a predicate, 3

B

Basis step, 170, 171
  for strong induction, 173–74
Binding, 7
Boldface:
  for names, 8, 158–59
  for sentences, 8, 158–59
  for variables, 8, 158–59
Bound variables, 30–31
Branches, 213,
Branching:
  finite, 213
  infinite, 215
Branching generation, 202, 205, 237

C

Closed sentences, 34
Compactness, 216, 243
Completeness, 163
  for predicate logic with function symbols, 246
  for predicate logic with identity, 245
  of the truth tree method, 183
Consistency, semantic and syntactic, 167, 189
Consistent set of sentences, 100–101, 127, 167
  truth tree test, 127
Constants (constant terms), 149
Contradictions, 100, 123
  derivation test, 100
  derived rule, 97
  truth tree test, 123–24
Co-referential names, 138, 142
Countable infinity, 243
Counterexamples, 26, 110, 112

D

Decision procedure, 238
Definite descriptions, 154
  narrow scope, 155
  primary occurrence, 155
  rewrite rule, 154
  secondary occurrence, 155
  wide scope, 155
Derivability, 162–63
Domain:
  of discourse, 6
  of an interpretation, 16
  restricted, 40
Double turnstyle, 163
Downward adequacy, 179, 182, 233
Downward correctness, 179, 185, 231–32

E

Empty set, 158
Equivalence relation, 145
E shriek, 139
  rewrite rule, 139
Existential elimination, 85
Existential generalization, 66–67
Existential introduction, 67–68
Existential quantifier:
  introduced, 6
  transcription, 47–48
  truth tree rule, 113
Extensional semantics, 143
Extension of a predicate, 143

F

Finished tree, 181, 230
Finite branching, 213
Free variable, 30–31
Functions, 147–53
  argument of, 147
  derivation rules, 150
  interpretation of, 148
  symbols, 148
  truth tree rules, 151
  value of, 147
  variables in, 148

G

Generation:
  branching, 202, 205, 237
  sequential, 202, 205, 209, 237
Governing premise or assumption, 7, 75

H

Hats, 74–76

I

Identity, 138
Identity, truth tree rules, 144
Identity elimination, 143
Identity introduction, 143
Inconsistency, syntactic, 189, 199
Inconsistent set of sentences, 100–101
  derivation test for, 101
  truth tree test for, 127
Induction, 169–70
  strong, 173
  weak, 171
  weak, strong formulation, 173
Inductive definition, 172
Inductive hypothesis, 170, 171
Inductive property, 170–71
Inductive step, 170, 171
Infinite branching, 215
Infinite semantic tableau derivations, 237–38
Infinite trees, 133–35, 230
Infinity:
  countable, 243
  uncountable, 243
Input sentence, 184
Intensional contexts, 142–43
Interpretations:
  with all objects named, 16–17
  of a sentence, 17
  for sentences with function symbols, 246
  for sentences with identity, 244
  with unnamed objects, 220–21
Inverted level, 208
Iota, 154
Isolated name, 85

K

König's lemma, 214

L

Least number principle, 174
Length of a sentence, 187–88
Level (inverted), 208
Lexicographical ordering, 218
Logical equivalence, 36, 101, 125
  derivation test, 101
  truth tree test, 125-26
Logical truth, 100, 124
  derivation test, 100
  truth tree test, 124
Löwenheim-Skolem Theorem, 243

M

Mathematical induction, 169–70
Mention, 159
Metalanguage, 157–58
Metavariables, 157–58
Minimal sentence, 181, 202
Model, 100–101, 127, 166–67

N

Names, 2, 4
Narrow scope, 155
Negated existentially quantified sentence, 37
  rule for logical equivalence, 37
Negated quantifier rules:
  derivations, 98
  truth trees, 119–20
Negated universally quantified sentence, 38
  rule for logical equivalence, 38

Negation introduction (derived rule), 97
New name, 112–13

O

Object language, 157
Opaque contexts, 142–43
Open formula, 10
Open sentence, 10, 34
Output list, 184

P

Paths (*see also* Branches)
Predicate logic, 2, 4
Predicates, 2, 4
  two place, 3–4
Presuppositions, 153
Primary occurrence, 155
Pronouns and variables, 7
Propositional function, 10

Q

Quantification logic, 2, 4

R

Reductio (derived rule) 97
Reflexivity, 145
Relations, 2
Restricted domain, 40
Rule soundness:
  for predicate logic connective, 193–96
  for quantifiers, 234–35

S

S-variant, 222
Satisfaction, 167
Scope, 30
Secondary occurrence, 155
Semantic consistency, 167
Semantics, 10, 161–62
Semantic tableau derivation, 200 ff
Sentence rule, 192
Sentences:
  closed, 34
  consistent set of, 100–101
  inconsistent set of, 100–101
  open, 10, 34
  of predicate logic, 9
  of sentence logic, 9
Sequential generation, 202, 205, 209 237
Set union, 176
Short cuts, truth tree, 131–33
Single turnstyle, 163
Soundness, 163
  of predicate logic connective rules, 193–96
  for predicate logic with function symbols, 244–45
  for predicate logic with identity, 246
  of quantifier rules, 234–35
  of the truth tree method, 183
Stand in names, 72–73
Strong induction, 173
Subderivation rule, 192
Subscripts:
  on quantifiers, 40–44
  rewrite rule, 42, 43
  use in transcribing, 55–56
Subset, 166
Substitution instances, 18–19, 21, 33
Substitutivity of identity, 142–43
Symmetry, 145
Syntactic consistency, 167, 189
Syntactic inconsistency, 189, 199
Syntax, 10, 161–62

T

Tableau:
  closed, 202, 205, 206, 241
  initial, 205
  open, 202
  terminal, 206
Terminal interpretation, 238–39
Transcription:
  existential quantifier, 47
  existential quantifier pitfalls, 48
  'no', 51
  'none', 51
  'none but', 51
  'not everything', 51
  'nothing', 51
  'only', 50–5
  universal qu
  universal qu
Transitivity, 1
Truth:
  of existentia
    sentenc
  of universal
    19, 35,
Truth tree sh
Turnstyle, 16
Two place fun

U

Uncountable i
Undecidability
Universal elim
Universal gen
Universal intr
Universal quai
  introduced,
  transcriptior
  truth tree ru
Un-named obj
Upward adequ