

# Index

- $=_V$ , 25  
 $=_{\beta\chi}$ , 23  
 $D(\theta)$ , 24  
 $E \vdash s = t$ , 48  
 $E$ , 46  
 $F[C \cup U]$ , 86  
 $F_l$ , 102  
 $F_{(P,\sim)}$ , 98  
 $G = (V, T, P, S)$ , 81  
 $H : - B$ , 102  
 $I(\theta)$ , 24  
 $S_l$ , 102  
 $S_{(P,\sim)}$ , 98  
 $T \downarrow \omega$ , 99  
 $T \uparrow \omega$ , 99  
 $T$ , 17  
 $T_0$ , 17, 29  
 $T_{(P,\sim)}$ , 98  
 $W$ , 50  
 $\square$ , 90  
 $\alpha/i$ , 81  
 $\beta\chi$ -calculus, 23  
 $\beta\chi$ -normal form, 23  
 $\beta$ -normal form, 22  
 $\beta$ -redex, 21  
 $\beta$ -reduction, 21  
 $\beta$ -reduction relation, 21  
 $\beta\eta$ -normalized substitution, 24  
 $\downarrow_{\mathcal{R}}$ , 49  
 $\eta$ -redex, 22  
 $\eta$ -reduction, 22  
 $\eta$ -reduction relation, 22  
 $\lambda$ -definable, 32  
 $\lambda$ -definitions, 54  
 $\overline{\top}$ , 54  
 $\overline{\times}$ , 54  
 $\overline{m}$ , 54  
 $\overline{x}$ , 54  
 $enc(\neg x)$ , 78  
 $enc(x \vee y)$ , 78  
 $enc(x \wedge y)$ , 78  
 $enc x$ , 78  
 $\lambda\delta$ -calculus, 75  
 $\langle \{\mathcal{D}_\alpha\}_\alpha, \mathcal{J} \rangle$ , 31  
 $\langle s, t \rangle$ , 50  
 $\models t$ , 32  
 $\models_{\sim} t$ , 41  
 $\overline{T}_{(P,\sim)} \downarrow \omega$ , 99  
 $\eta$ -expansion, 22  
 $\eta$ -expansion relation, 22  
 $\eta$ -redex, 22  
 $\phi$ , 31  
 $\sigma\theta$ , 24  
 $\sim$ , 40  
 $\sim$ - $\lambda$ -model, 41  
 $\sim$ -propositional interpretation, 42  
 $\sim_1 \cap \sim_2$ , 96  
 $\theta[V]$ , 24  
 $\uparrow_{\mathcal{R}}$ , 49  
 $\varphi_{\sim}$ , 42  
 $\zeta$ , 56  
 $\{\mathcal{D}_\alpha\}_\alpha$ , 30  
 $\{\top, F\}$ , 30  
 $n$ th resolution, 92  
 $order(\alpha)$ , 17  
 $order_{unif}\alpha$ , 50  
 $r \longrightarrow_{[i,s=t,\rho]} p$ , 46  
 $s \Rightarrow_G s[i \leftarrow t]$ , 81  
 $s \sim t$ , 41  
 $t$  is valid in  $\mathcal{M}$ , 32  
 $t/i$ , 19  
 $t[i \leftarrow s]$ , 20  
 $t\theta$ , 24  
 $t\{(C, x)\}$ , 67  
 $t\{(x, s)\}$ , 20  
 $tag(r)$ , 70  
 $D$ , 76  
 $\mathcal{C}$ , 18

- 
- $\mathcal{D}_\alpha$ , 30
  - $\mathcal{D}_t$ , 30
  - $\mathcal{F}(W)$ , 50
  - $\mathcal{F}(t)$ , 19
  - $\mathcal{I}$ , 81
  - $\mathcal{J}$ , 30
  - $\mathcal{M} \cap \mathcal{N}$ , 96
  - $\mathcal{M} \models t$ , 32, 41
  - $\mathcal{M} \equiv$ , 97
  - $\mathcal{M} \sim$ , 91, 97
  - $\mathcal{OF}(t)$ , 19
  - $\mathcal{O}(t)$ , 19
  - $\mathcal{O}\tau(\alpha)$ , 81
  - $\mathcal{PW}$ , 56
  - $\mathcal{PW}$ , 56
  - $\mathcal{R}_\sim(S)$ , 92
  - $\mathcal{R}_\sim^n(S)$ , 92
  - $\mathcal{S}_t$ , 30
  - $\mathcal{T}$ , 18
  - $\mathcal{UW}$ , 56
  - $\mathcal{U}_E W$ , 50
  - $\mathcal{V}^{\mathcal{M}}$ , 31, 41
  - $\mathcal{V}_\phi$ , 31
  - $\mathcal{V}_t$ , 31
  - $\mathcal{X}$ , 18
  - binder*( $t$ ), 22
  - head*( $t$ ), 22
  - $\leq_V$ , 25
  - $\triangleright_{1\alpha}$ , 20
  - $\triangleright_{1\beta}$ , 21
  - $\triangleright_{1\eta}$ , 22
  - $\triangleright_{1\bar{\eta}}$ , 22
  - $\triangleright_\alpha$ , 20
  - $\triangleright_\beta$ , 21
  - $\triangleright_\eta$ , 22
  - $\triangleright_{\bar{\eta}}$ , 22
  - $\text{gfp}(T_{(P,\sim)})$ , 99
  - $\text{lfp}(T_{(P,\sim)})$ , 99
  - $\xrightarrow{*}_E$ , 50
  - length*( $t$ ), 85
  - $|P|$ , 98
  - $|\alpha|$ , 81
  - answer substitution, 100
  - arity of a type, 81
  - assignment, 31
  - BF-derivation, 100
    - failed, 100
    - input list, 100
    - successful, 100
  - BF-resolution, 100
  - BF-tree, 100
    - failed branch, 101
    - finite failure, 101
    - finitely failed, 101
    - successful branch, 101
  - binder, 22
  - bound variable, 19
  - capture free form, 21
  - clause form, 89
  - clauses renamed apart, 100
  - closed CTT clause, 90
  - closed CTT resolution, 92
  - closed CTT resolvent, 91
  - closed formula, 29
  - closed instance of a term, 24
  - closed instances of clauses, 98
  - Closed Resolution Theorem, 92
  - closed substitution, 24
  - comp*( $P$ ), 12
  - completed definition, 11
  - completion of a logic program, 12
  - composition of substitutions, 24
  - confluence, 49
  - conjunctive normal form, 35
  - continuous function, 99
  - CSIP, 56
  - CSMS, 56
  - CSMU, 56
  - CTT base, 98
  - CTT clause, 89
  - CTT definite clause, 94
  - CTT formula, 33
  - CTT goal clause, 94
  - CTT logic program, 94
    - examples, 95
  - CTT resolvent, 92
  - CTT term, 33

- 
- CTT universe, 90
  - d-node, 69
  - decomposition node, 69
  - delta function, 75
    - $\Delta$ , 75
    - $\delta$ -Reduction, 75
  - denotation function, 30
  - denotation of a closed term, 31
  - denotation of a constant, 30
  - denotation of a logical constant, 30
  - direct derivation in a term grammar, 81
  - disagreement pair, 50
  - disagreement set, 50
  - domain, 30
  - domain of a substitution, 24
  - domain of individuals, 30
  - dyad combinator, 76
  - elementary type symbols, 17
  - empty clause, 90
  - entailment, 48
  - equality relation on substitutions, 25
  - equational theory, 46
    - abbreviated equation, 46
  - extended polynomial, 76
  - Finite Completeness Theorem, 74
  - finite failure set, 98
  - fixed point of  $T$ , 99
  - formula, 29
  - formula of a goal, 100
  - frame, 30
  - free variable, 19
  - free variables of terms in a disagreement set, 50
  - full type hierarchy, 73
  - general  $\sim$ -model, 40
  - general model, 31
  - goal clause, 8
  - head, 22
  - Herbrand model, 9
    - least, 9
  - higher-order  $E$ -unifiability relation, 50
  - higher-order compound instance, 42
  - higher-order equational unifier, 50
  - higher-order expansion, 42
  - higher-order rewrite relation, 46
  - higher-order unifier, 56
  - Horn clause, 8
  - Horn clause program, 8
  - imitation substitution, 58
  - instance of a term, 24
  - interpretation, 31
  - intersection of  $\lambda$ -models, 96
  - intersection of term relations, 96
  - introduced variables, 24
  - iterated MATCH tree, 68
  - label, 70
  - least fixed point of  $T$ , 99
  - literal, 35
    - closed literal, 90
    - negative literal, 35
    - positive literal, 35
  - logical completeness, 52
  - logical constant, 29
  - logical soundness, 52
  - matcher, 56
  - matrix, 22
  - mixed pair, 90
  - monoid on  $C$  and  $U$ , 86
  - monoid problem, 86
  - normal form CTT formula, 36
  - normal form transformations, 34
  - occurrence, 18
  - ordering relation on substitutions, 25
  - order of a type symbol, 17
  - order of a unification problem, 50
  - parameter, 29
  - pattern matching problem with delta functions, 75
  - Plotkin-Statman Conjecture, 73
  - pre-unifier, 56
  - projectile, 68
  - projection substitution, 58

- 
- propositionally  $\sim$ -unsatisfiable compound instance, 42
  - propositionally  $\sim$ -unsatisfiable expansion, 42
  - range question, 74
  - recurrent projection, 70
  - regular unification problem, 84
  - renaming substitution, 24
  - replacement of  $t/i$  by term  $s$ , 20
  - replacement of  $x$  by  $s$  in  $t$ , 20
  - restriction of a substitution, 24
  - rewrite rule, 33
  - rule of  $\alpha$ -conversion, 20
  - satisfiable, 32
  - satisfiable in a  $\sim$ - $\lambda$ -model, 41
  - saturation, 90
  - second-order monadic matching, 85
  - second-order monadic term, 84
  - second-order monadic unification, 85
  - semi-unifier, 56
  - set of constant symbols, 18
  - set of elementary types, 29
  - set of free variables in term  $t$ , 19
  - set of occurrences of a term, 19
  - set of occurrences of free variables, 19
  - set of simply typed  $\lambda$ -terms, 18
  - set of type symbols, 17
  - set of variables, 18
  - signature, 29
  - signum functions, 77
    - $\overline{sg}$ , 77
    - $sg$ , 77
  - simply typed  $\lambda$ -term, 18
  - SLD-derivation, 101
  - SLD-resolution, 8
  - SLD-tree, 10, 101
    - failed branch, 101
    - fair, 10, 101
    - fair branch, 101
    - finitely failed, 10, 101
    - success branch, 10
    - successful branch, 101
  - sound and complete set of  $E$ -unifiers, 53
  - standard model, 31
  - substitution, 24
  - subterm, 19
  - subterm of  $t$  at occurrence  $i$ , 19
  - subtype of  $\alpha$  at type occurrence  $i$ , 81
  - success set, 98
  - tagged term, 70
  - term grammar, 81
  - term of the Simple Theory of Types, 29
  - term over  $\mathcal{S}$ , 29
  - term relation, 40
  - truncated branch, 71
  - truncated MATCH tree, 71
  - truth value, 30
  - type occurrences, 81
  - unification order of a type symbol, 50
  - valid, 32
  - valid in a  $\sim$ - $\lambda$ -model, 41
  - valid in the general sense, 32
  - valid in the standard sense, 32
  - valuation function, 31
  - valuation of a term, 31