Symbolic Computation 01/04/10

Lecture 1: Inference Rules

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Abstract Syntax
- an expression is a tree with every node labeled with a character string

Concrete Syntax
- a character string

Variables
- strings are divided into "variable" and "non-variables".

A inference rule has
1) A sequence of "antecedent"
2) A conclusion expression

$R = \{\frac{f(x)}{f(g(x,x))}, \frac{}{f(a)}\}$
$rule(ants(f(x)), f(g(x,x)))$
$\vdash_R f(a)$
$\vdash_R f(g(a,a))$
$\vdash_R f(g(g(a,a), g(a,a)))$

A substitution is a mapping from variables to expressions.
If σ is a substitution, then we write $\sigma(x)$ for the expression σ assigns to variable x.
If e is an expression, then $\sigma(e)$ is the result of replacing each variable x in e with $\sigma(x)$.

Consider a rule

$$\frac{\begin{array}{c} A_1 \\ \vdots \\ A_n \end{array}}{C}$$

consider a substitution σ.
If

$$\frac{\begin{array}{c} A_1 \\ \vdots \\ A_n \end{array}}{C}$$

is in R and σ is a substitution and $\vdash_R \sigma(A_1) \ldots \sigma(A_n)$, then $\vdash_R \sigma(C)$.

ex) $\vdash_R f(a) \quad \sigma(x) = a \quad \sigma(x) = g(a, a)$
$\vdash_R f(g(a, a)) \quad \vdash_R f(g(g(a, a), g(a, a)))$