CS345A PROBLEM SET #4

Due in class, Wednesday, May 4, 1994

1) (15 points) Sorry — I should have included this question with Problem Set 3. Suppose we have the relation R whose value is the four tuples:

R_1	R_2
a	b
$f(a)$	$g(b)$
$f\big(g(a)\big)$	$g\big(f(b)\big)$
$f\big(f(a)\big)$	$f(a)$

Perform the following translations.

a) $Q(X,Y) = \text{ATOV}\Big(p\big(f(X), g(Y)\big),\ R\Big)$.

b) $Q(X,Y) = \text{ATOV}\Big(p\big(f(X), X\big),\ R\Big)$.

c) $P = \text{VTOA}\Big(p\big(h(X,Y), g(X)\big),\ R(X,Y)\Big)$.

2) (10 points) Consider the rules

```
p(X,Y,Z) :- q(X,Y,Z)
p(X,Y,Z) :- p(X,A,Y) & p(Y,B,Z)
```

Draw the rule/goal graph starting with the adorned goal p^{bff}.

3) (15 points) For the rules of Problem (2) and the query $p(0,U,V)$, write the magic-set rules, using the basic method of Section 13.1.

4) (10 points) Repeat Problem 3 using the "simplified" method of Section 13.4.

5) (20 points) Below are rules that define terms representing the structure of arithmetic expressions with $+$, $\times$, and parentheses.

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expression(plus(E,T))) :- expression(E) & product(T).
expression(E) :- product(E).

product(times(T,F)) :- product(T) & factor(F).
product(T) :- factor(T).

factor(parens(E)) :- expression(E).
factor(F) :- identifier(F).
```

Write the magic-set rules for the query form $expression^b$. For Group V you may imagine that the query is about some term e_0, which we are testing to see if it has the correct form of an expression. You may use either the "basic" or "simplified" method.