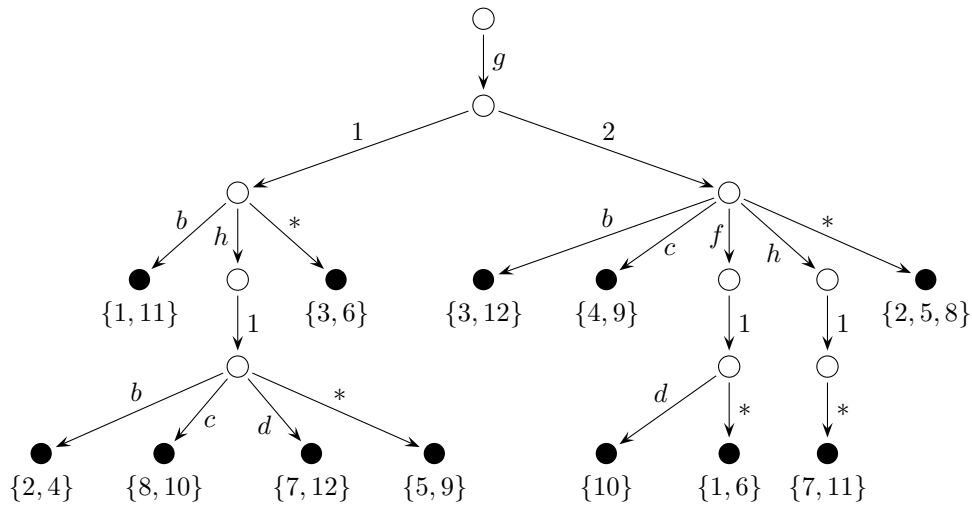# Automated Theorem Proving

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based on exercises by Dr. Uwe Waldmann

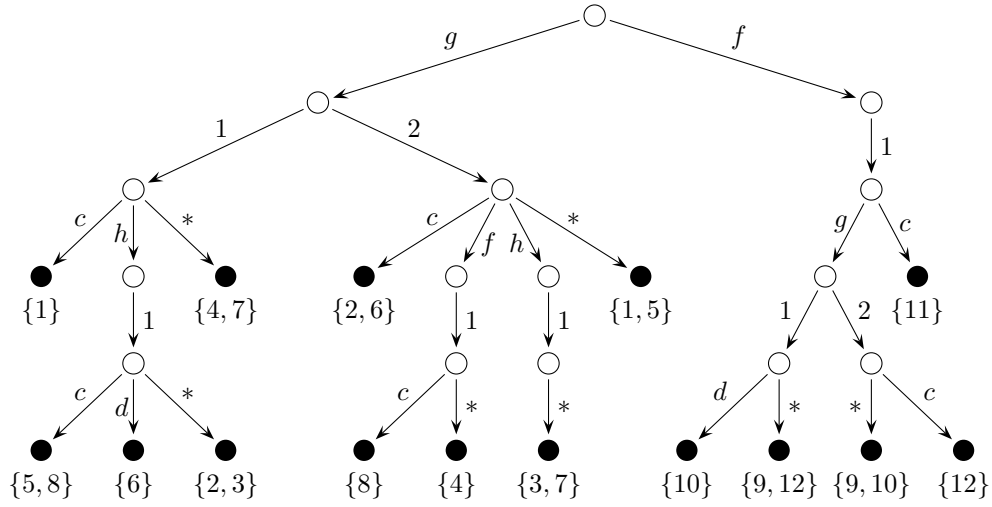Winter Term 2024/25

Exercises 14: Efficient Saturation Procedures and Outlook

Exercise 14.1: Consider the following path index:

Does path index contain the terms $t_1 = g(h(d), h(*))$, $t_2 = g(h(b), c)$, $t_3 = g(*, *)$? If yes, what are their numbers in the index?

Exercise 14.2: Consider the following path index:

g   f

1   2   1

c h *   c f h *   g c

{1}   {4,7}   {2,6}   {1,5}   {11}

1   1   1   1   2

c d *   c *   *   d * * c

{5,8}   {6}   {2,3}   {8}   {4}   {3,7}   {10}   {9,12}   {9,10}   {12}

(a) Which terms have the numbers 3, 5, and 12 in the path index?

(b) Which of the terms $g(*, h(*))$, $f(g(d, c))$, and $g(h(*), c)$ are contained in the path index? If they are contained, what are their numbers?

(c) Assume that the terms in the path index are the left-hand sides of the rewrite rules of a TRS R. Is the term $f(g(h(d), f(c)))$ reducible by rules in R? If yes, what are the numbers of the left-hand sides of these rules?

Exercise 14.3: Could one use the following numbers as features in a feature vector index?

(1) the number of ground arguments of predicate symbols in a clause,

(2) the number of variable occurrences in a clause,

(3) the number of constant symbols occurring in positive literals in a clause,

(4) the number of literals in a clause that do not contain variables,

(5) the number of literals in a clause that do not contain the function symbol f,

(6) the number of literals in a clause that do not contain the predicate symbol P,

(7) the number of literals in a clause that contain neither variables nor the function symbol f,

(8) the number of distinct variables in a clause.