

ILFP - 23

Unification Alg [Robinson's Alg.]
X

A-3 [Priv test
cases]

Marking scheme

Prolog:
Predicate ←

• dataset : A simple fact
Collection
(aarti, babli) =



facts :

Symbols : objects of the world

Constructor :

Predicates

ground term → symbol or compound name

pair (aarti, babil).

facts

in dataset

- grain-size of obj

- abstraction

- reification

Parent (aarti, Babil)

Variables

parent (X, Y)

Parent (X, divya).

Bunty



Query

Queries

- true-or-false
- fill-in-the-blanks

brown(bear).

big(bear).

gray(Elephant).

big(Elephant).

dark(Z) :- black(Z).

dark(Z) :- brown(Z).

dangerous(X) :- dark(X), big(X)

G_1, G_2, \dots, G_n

Find a clause

$H :- B_1, \dots, B_k$

s.t. $G_i \models H$

fails

Cut operator

Deductive
Syntactic rules

Resolution

FOL
PropL

Dangerous(Q)

dangerous(x) :-
dark(x), big(x)

dark(Q)

big(Q)

bear

black(Q),
big(Q)

cat X

brown(Q),
big(Q)

big(bear)

unification
N-Successor Adl

$\text{reach}(X, Y) :- \overbrace{\text{reach}(X, Z)}^{\text{edge } (Z, Y).},$

Procedural ~~to~~ eval of
prolog program

Lists, Trees, Matching & Unification

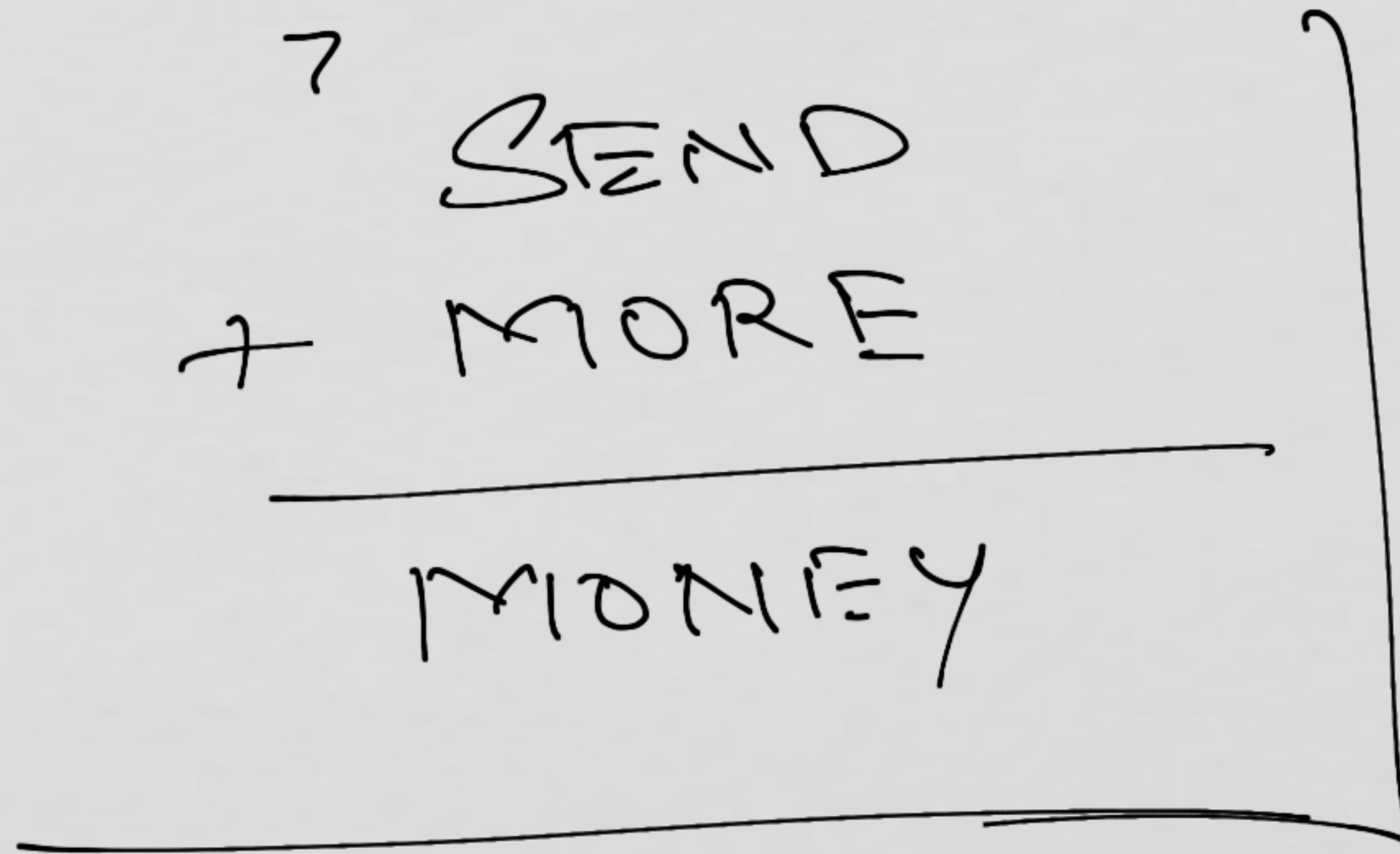
↳
Sorting
Searching

[Robinson's Alg.]

All Eval.

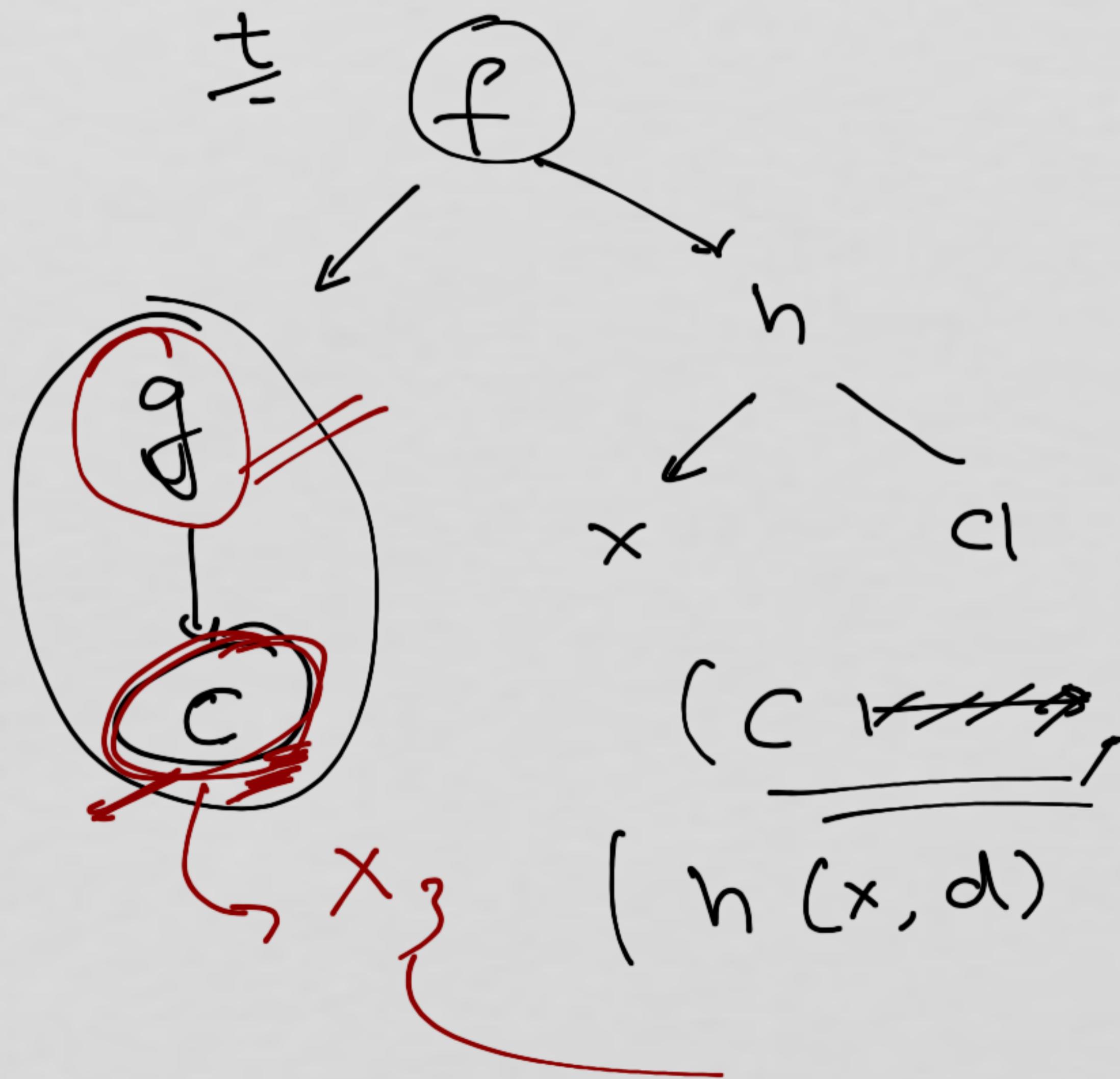
Recursive func. → facts,
Fibonacci

$$\begin{array}{r} ? \\ SEND \\ + MORE \\ \hline MONEY \end{array}$$

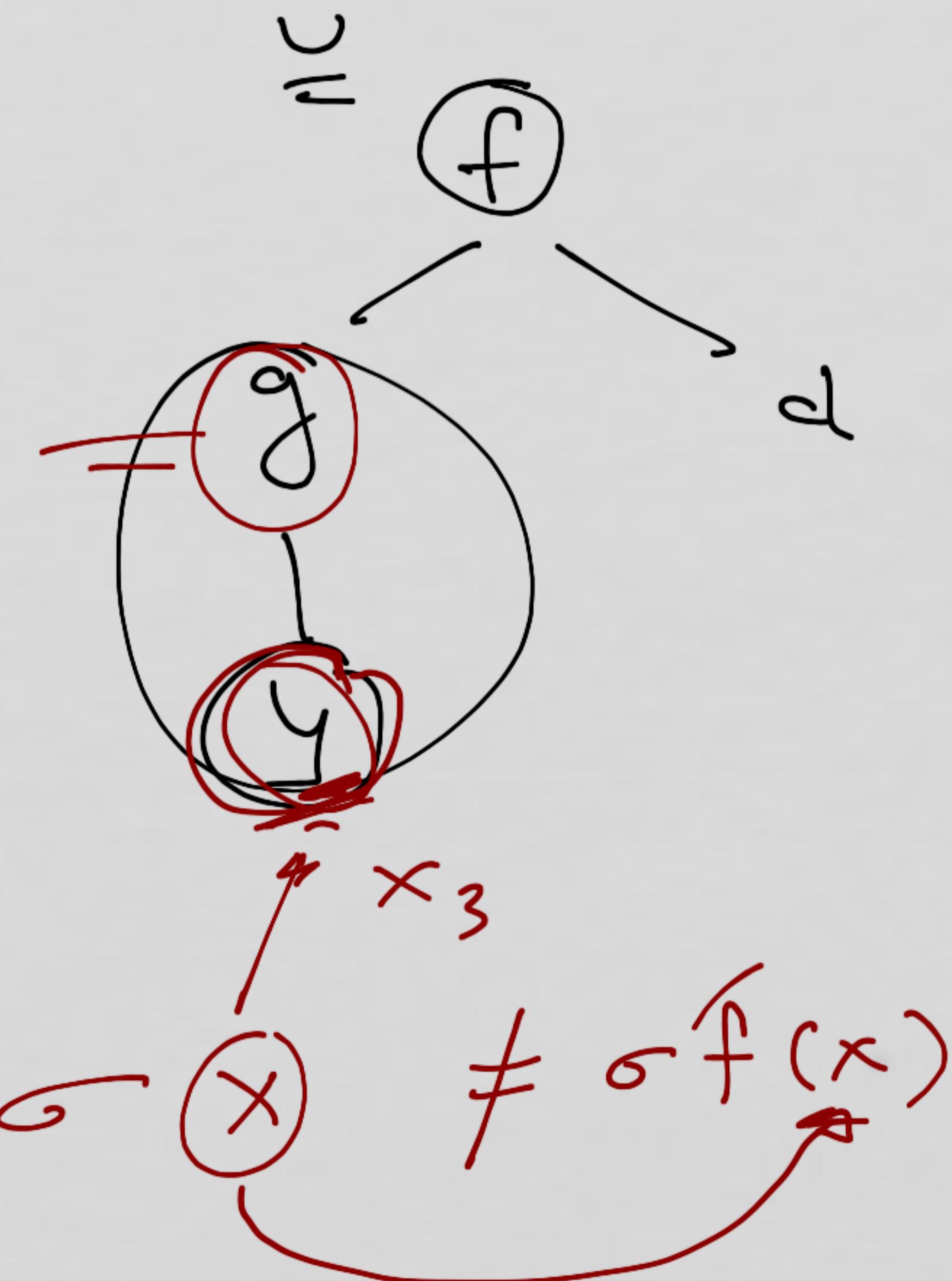


$$\underline{t} = f(g(c), h(x, d))$$

$$\underline{u} = f(g(y), d)$$



Disagreement Pair



For terms $t \wedge u$

d_1, d_2 are a disagreement pair

if

- o $d_1 \wedge d_2$ are subterms of $t \wedge u$,
- respectively
- o Path to d_1 in t is same as path to d_2 in u ,
- o roots of d_1, d_2 are different

Robinson's Alg

$t, u \in \Sigma^*$

$\sigma = \{ \}$ logical eq.
while $t \sigma \neq u \sigma$ do

choose a disagreement pair d_1, d_2

in $t \sigma$ and $u \sigma$

[if both d_1 & d_2 are non-variables
then return FAILURE
if $d_1 \in \text{Var}$ then
 $\sigma := d_1, s := d_2$

else

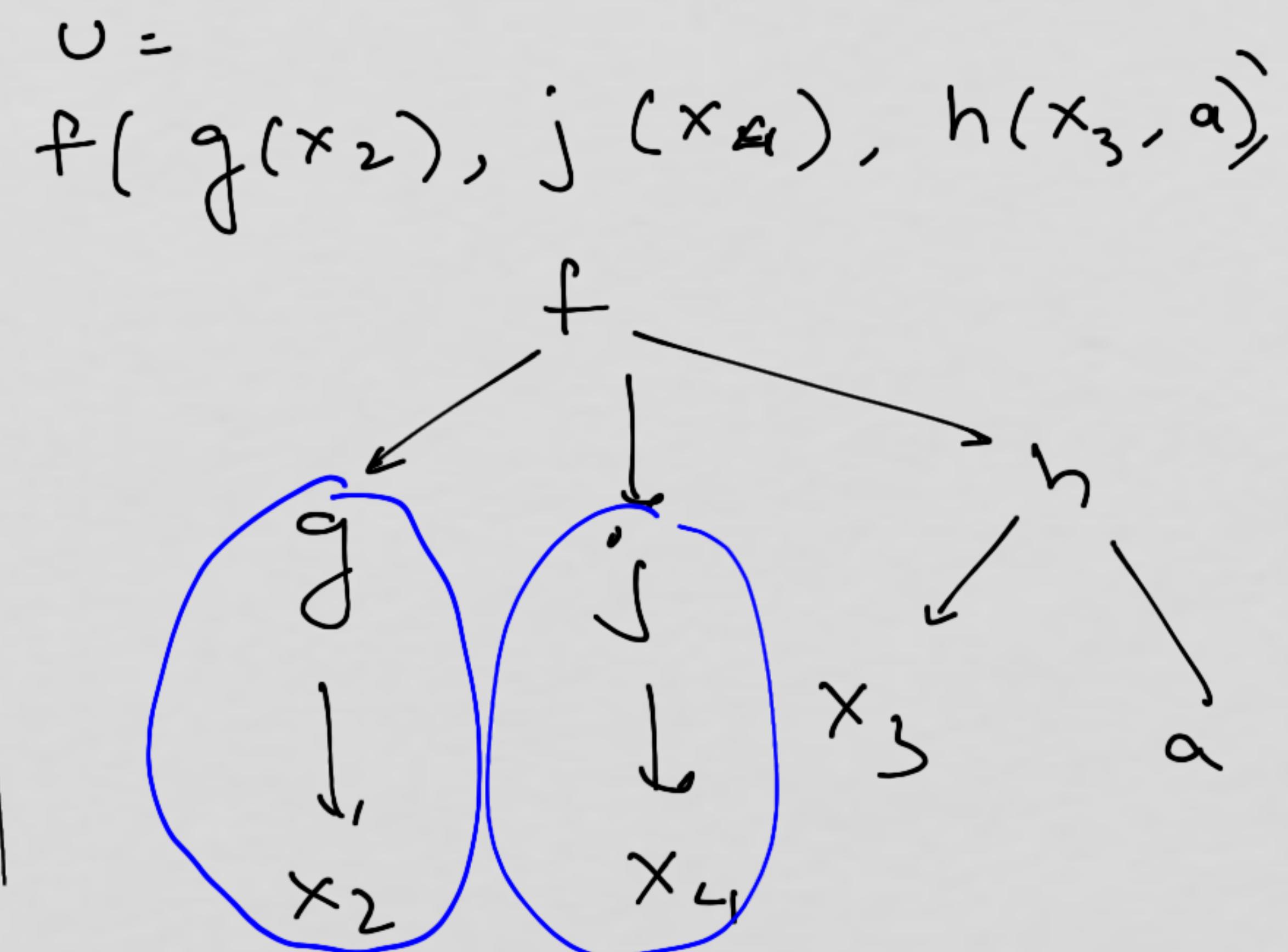
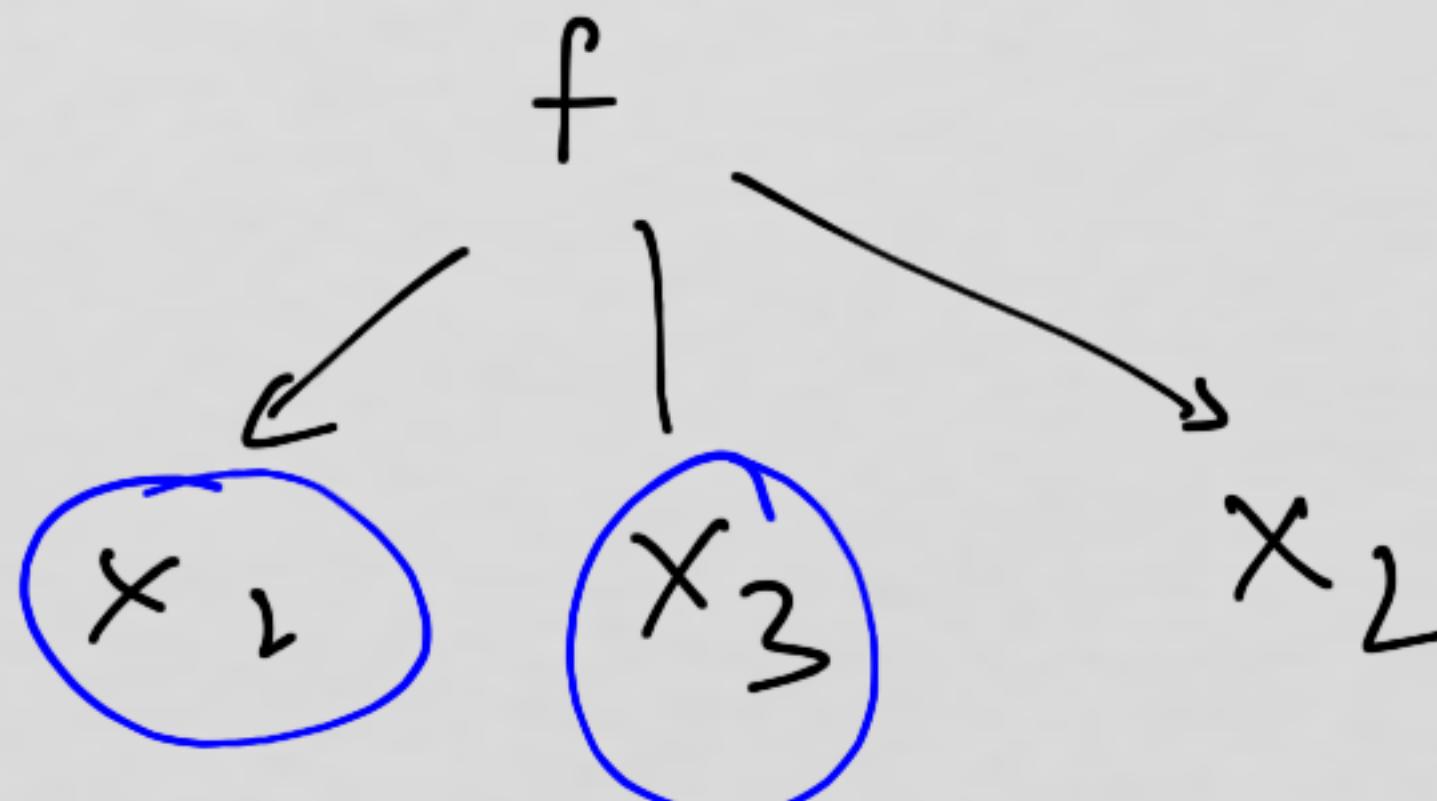
$\sigma := d_2, s := d_1$

if $x \in FV(s)$ then
return FAIL

$\sigma := \sigma \{ x \mapsto s \}$

// update
the
subst.

$$t = \underline{\underline{f(x_1, x_3, x_2)}}$$



Disagreement Pairs

$$\{(x_1, g(x_2)), (x_3, j(x_4)), \\ (x_2, h(x_3, a))\}$$

$$G = \{x_1 \mapsto g(x_2)\}$$

$$f(g(x_2), x_3, x_2)$$

$$G = \{x_1 \mapsto g(x_2), \\ x_3 \mapsto j(x_4)\}$$

$$f(g(x_2), j(x_4), h(x_3, a))$$

Disagreement pairs

$$\left\{ \underbrace{(x_1, g(x_2))}_{(x_2, h(x_3, a))}, (x_3, j(x_4)), \right.$$

$$\sigma = \left\{ x_1 \xrightarrow{\quad} g(x_2) \right\}$$

$$f(g(x_2), x_3, x_2) \quad \mid \quad f(g(x_2), j(x_4), h(x_3, a))$$

$$\sigma = \left\{ \begin{array}{l} x_1 \xrightarrow{\quad} g(x_2), \\ x_3 \xrightarrow{\quad} j(x_4) \end{array} \right\}$$

$$\stackrel{?}{=} f(g(x_2), j(x_4), x_2)$$

$$\sigma := \sigma \setminus \left\{ x_2 \xrightarrow{\quad} h(x_3, a) \right\}$$

(6) $\vdash := \left\{ \begin{array}{l} x_1 \xrightarrow{\quad} g(h(j(x_4), a)), \\ x_3 \xrightarrow{\quad} j(x_4), \\ x_2 \xrightarrow{\quad} h(j(x_4), a) \end{array} \right\}$

$$\begin{aligned} t\sigma &= \\ f(g(h(j(x_4), a)), j(x_4), h(j(x_4), a)) \\ &= \cup \sigma \end{aligned}$$