Unsafe Formulas :

$F_1(x) = x < 3$

$F_2(x) = \neg borders(\text{"}\cancel{D}\text{"}^{de}, X)$

$F_3(x,y,z) = p(x,y) \vee q(x,z)$?

$F_1'(x) = \exists c: Country(c) \wedge area(c,X) \wedge X < 3$

$\{\{X/0{,}44\}, (X/1{,}43), \dots\}$

$F_2'(X) = \exists c: country(c) \wedge code(c,X) \wedge \neg border(\text{"}\cancel{X}\text{"}^{de}, X)$

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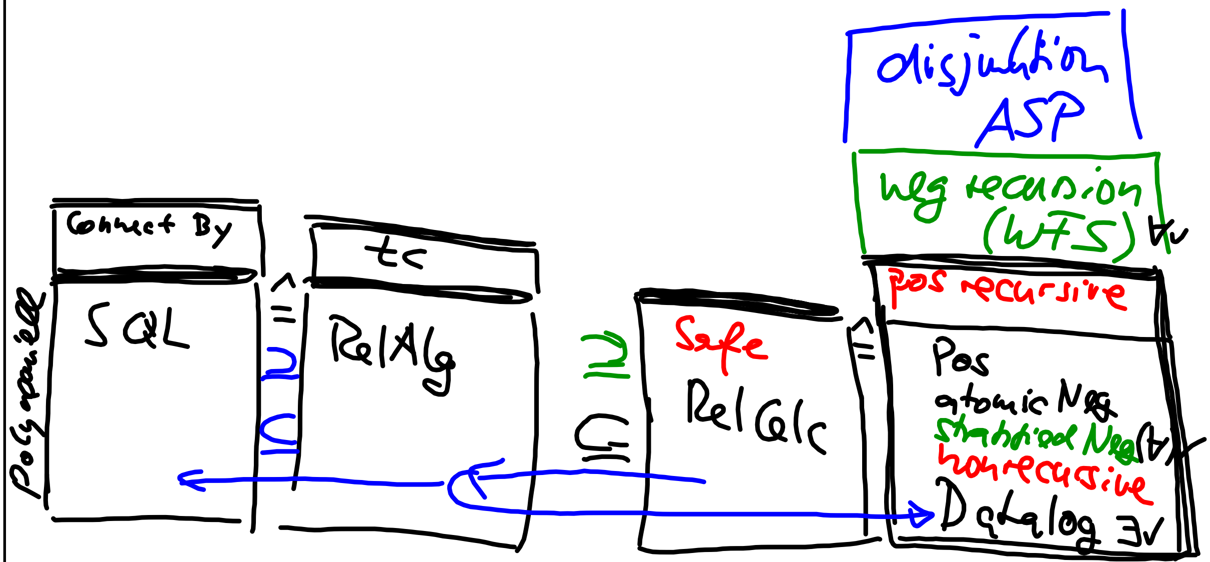
$\forall x\, p(x) = \neg \exists x: \neg p(x)$



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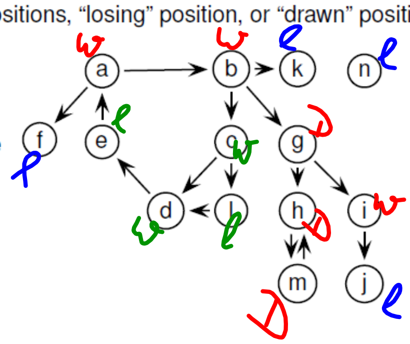
Example: Win-Move-Game

- 2 players,
- places on a board that are connected by (directed) moves (relation “move(x,y)”),
- first player puts a pebble on a position,
- players alternately move the pebble from x to a connected y,
- if a player cannot move, he loses.
- Question: which positions are “winning” positions, “losing” position, or “drawn” positions?

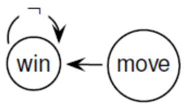
The following program “describes” the game:

```
win(X) :-  move(X,Y), not win(Y).
```



- the dependency graph contains a negative cycle:

neg recursion



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$$\underbrace{p(X,3)}_{r=\{X\}} \wedge Z=Y \wedge \underbrace{q(Z,Y)}_{r=\{Y\}}$$

$r=\{X\}$

$r=\{X\}$

$r=\{X,Y,Z\}$

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