

1) $R(A, B, C) \bowtie_{\text{null}} S(A, B, D)$

R

1, 2, 3
2, 3, 5
2, null, 6
null, 2, 9

S

1, 2, 4
2, null, 6
3, null, 3
null, 2, 5

H	B	C	D
1	2	3	4
2	3	5	6
2	null	6	6
1	2	1	6
1	2	1	4
2	2	1	5
3	2	1	5
3	2	1	5

$\sigma_{R.A=S.A \wedge R.B=S.B} (R \times S)$
 $R.B \text{ is null } \vee S.B \text{ is null}$
 $\pi[A: B: C: D] (\dots)$
 create(R, S)
 create(S, R)

$[R.A, R.B, R.C, S.A, S.B, S.C]$

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b)

R

X, Y, Z

S

X, W

alle X, Y, so dass es X kein W existiert

SPRACHE:

$\pi[X, Y](R \setminus S)$ select x, y from R where not x in (select * from S)

→ make x in R, so dass x nicht in S, aber x, y aus R

Rel. Algebra:

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    graph TD
        RS[R \setminus S] --> X[X]
        RS --> Y[Y]
        X --> RX[R]
        Y --> RY[R]
        RS --> XW[X, W]
        XW --> X
        XW --> W[W]
    
```

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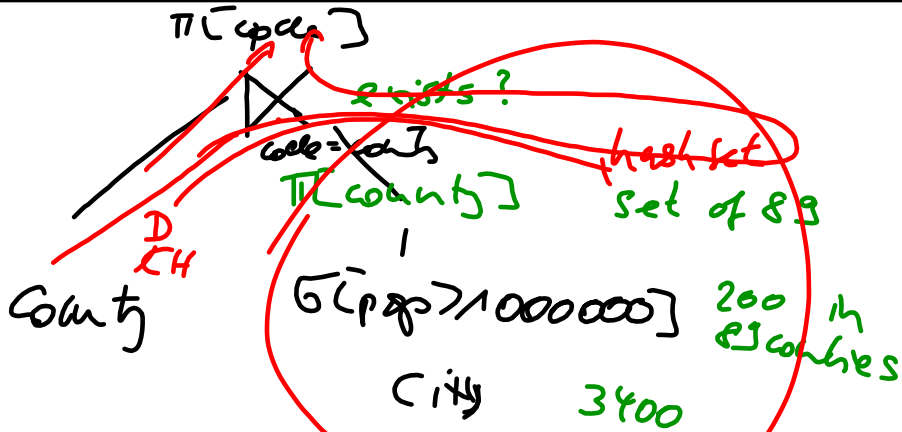
"Antijoin" für rel. Algebra

$R \setminus_{\text{Spalte}} S :=$

select * $R \text{ minus } \left(\underbrace{\pi[\text{attr}(R)](R \bowtie S)}_{RAS} \right)$
 R where not exists
 ; ... appears in S

left semijoin
 "Antijoin als Antijoin"

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$R(A, B) \quad S(A, B)$
 $R \text{ minus } S$
 \equiv
 $R \text{ where not exists ... predicate in } S$
 $\equiv R \setminus S$

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c) ~~SQL~~ 1.0 "minus"

$Q_1(?X, ?Y) \text{ minus } Q_2(?X, ?Y) ?$
 $\{Q_2\}$

$\text{NOT BOUND}(?Y)$

Select
 Row
 Where $\{Q_1\}$ where ein Teil
 normal $\{Q_2, \{A ? B ? Z\}$
 Filter $\text{not bound}(?Z)$

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d) Del Algebra, left order, in

$R \setminus S$

$$:= R \setminus S \cup (R \setminus (R \setminus S)) \times N_{\text{of } S}$$
Bsp 9/:

$$R \setminus S \cup R \setminus S$$

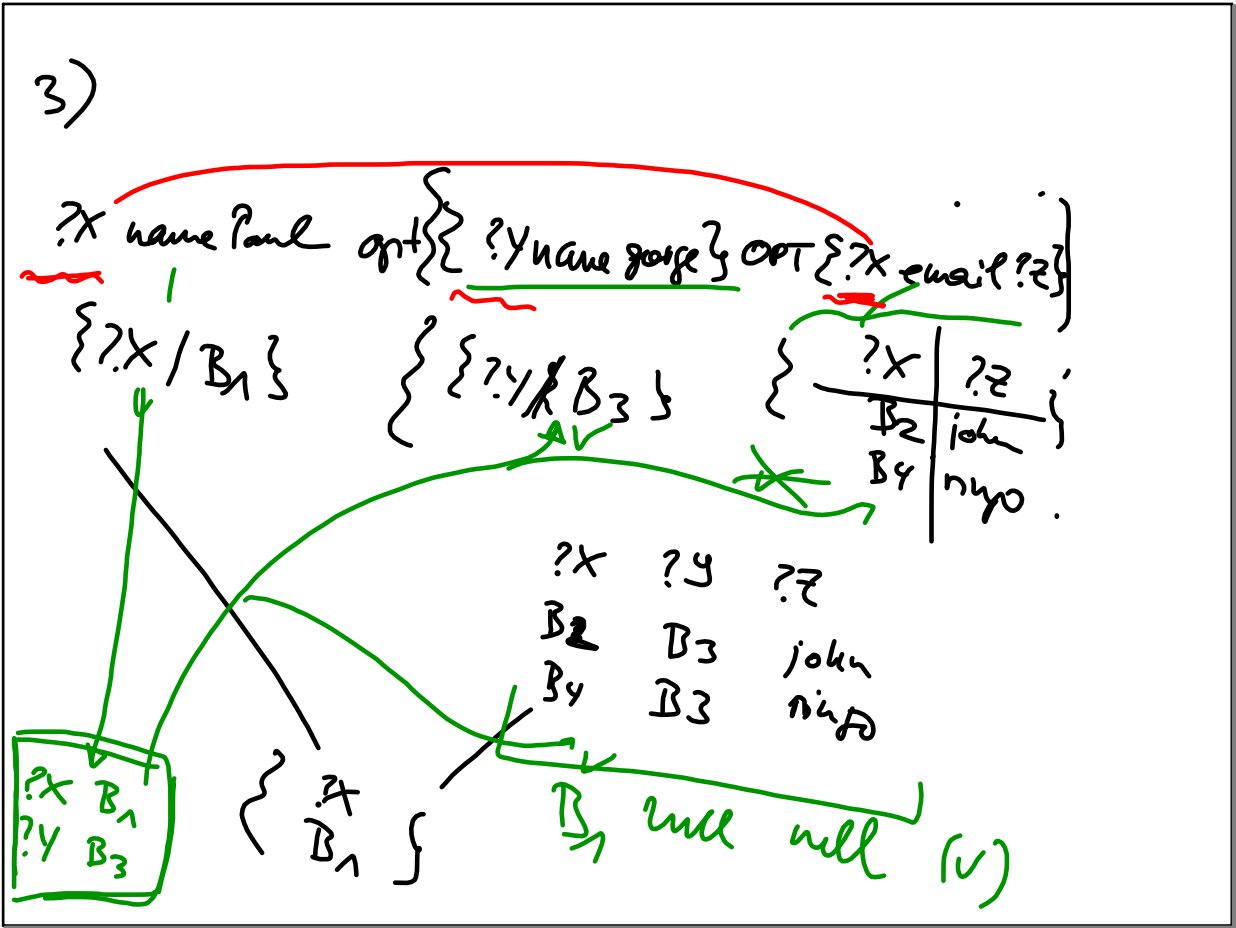
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$$2) R \setminus S = \underbrace{R \setminus S}_{\text{BPT}} \cup \overbrace{R \setminus S}^{S \setminus R}$$

$$= R \setminus S \cup R \setminus S \cup S \setminus R$$

2.26 for Friday

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