Physical Layout

{ Delimited, Fixed Width, Directory } × { fields in a record, records in a ~~field~~ page } = 6 choices per table

Indexing

{ primary, secondary } × { Hash, Tree, -- } = 4+ choices per attribute combo

Algos for Sort

{ in-mem, external } = 2 choices per sort

Algos for G.B. Agg

{ In-Mem Hash Table (1-pass), Sort First, pre-Bin with Hash Table (2-pass) } = 3 choices per g.b. agg

Join Algos

NLJ, BNLJ, SMJ, INLJ, 1-pHJ, 2-pHJ, 2-pTJ = 7 choices per Join

$$\pi_A(\sigma_C(R)) \equiv \sigma_C(\pi_A(R))$$

(if attrib of $\underline{c}$ are in $\underline{A}$)

$$\pi_A(\sigma_{A<B}(R))$$

$$\pi_A(\pi_{A,B}(\sigma_{A<B}(R)))$$ idemp of π

$$\pi_A(\sigma_{A<B}(\underbrace{\pi_{A,B}(R)}))$$

$$
\begin{aligned}
& R \times (S \times T) \\
= \ & R \times (T \times S) \\
= \ & (R \times T) \times S \\
= \ & (T \times R) \times S \\
= \ & T \times (R \times S)
\end{aligned}
$$

Expression	Meaning
R	a table
$\sigma_{A=5} R$	~~pix~~ filter elements in R
$\pi_{A=B+C,B,C} R$	map/transform the rows of R
$\gamma_{A,B,\mathrm{SUM}(C)} R$	(g.b.) aggregate the rows of R
$R \times S$	pair all rows of R and S
$R \bowtie_c S = \sigma_c(R \times S)$	"Join" R and S w/ condition C
$R \cup S$	~~merge~~ union rows of R and S

$\tau_A R$	Sort rows of R by A
δR	All distinct rows of R (Bag $\rightarrow$ Set)
$L_{10} R$	First 10 rows of R

$$\sigma_{R.B=S.B \wedge R.A>3}(R \times S)$$

$$\sigma_{R.B=S.B}\left(\sigma_{R.A>3}(R \times S)\right)$$

$$\sigma_{R.A>3}\left(\sigma_{R.B=S.B}(R \times S)\right)$$

$$\sigma_{R.A>3}\left(R \bowtie_{R.B=S.B} S\right)$$

Selection

$$\sigma_{c_1 \wedge c_2} R \equiv \sigma_{c_1}\left(\sigma_{c_2}(R)\right)$$ Rule 1

$$\begin{aligned}
\sigma_{c_1}\left(\sigma_{c_2}(R)\right) &\stackrel{?}{=} \sigma_{c_2}\left(\sigma_{c_1}(R)\right) && \text{Rule 2 (selection commutative)} \\
&= \sigma_{c_2 \wedge c_1}(R) && \text{rule 1} \\
&= \sigma_{c_1 \wedge c_2}(R) && \text{and commutes} \\
&= \sigma_{c_1}\left(\sigma_{c_2}(R)\right) && \text{rule 1}
\end{aligned}$$

Projection

$$\Pi_A R = \cancel{\Pi_{A \cup B}} \; \Pi_A\left(\Pi_{A \cup B}(R)\right)$$

R	A
	1
	1
	2

$$\overbrace{\underbrace{1} + \underbrace{1}} = \overbrace{2}$$

R

$$(x^2-1) = (x+1)\cdot(x-1)$$

$$\sigma_c(R \times S)$$

attrib of c
and are **all** in R

$$\equiv (\sigma_c(R)) \times S$$

$$\sigma_{c_1}(R \bowtie_{c_2} S)$$

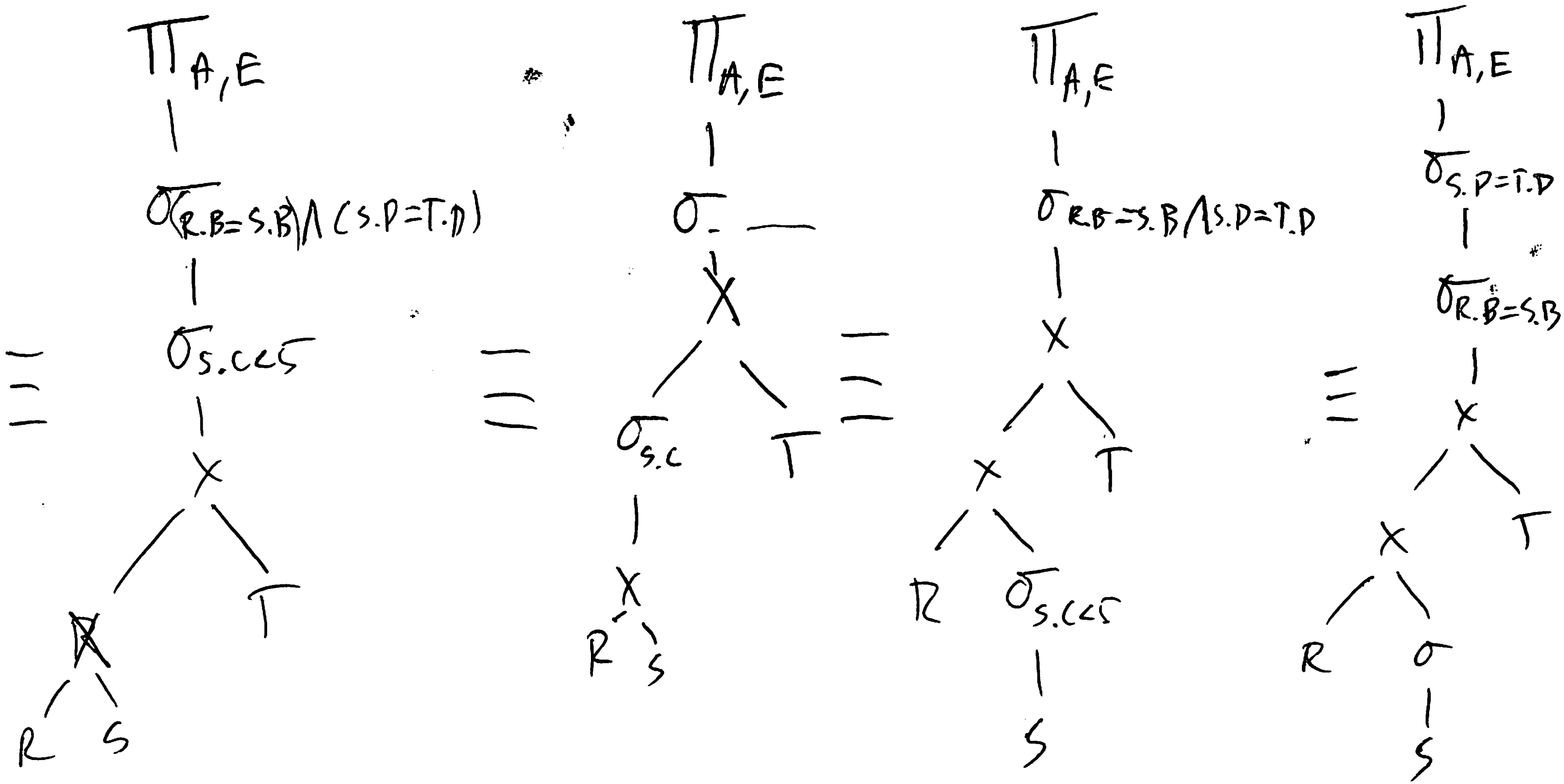
$$\equiv \sigma_{c_1}(\sigma_{c_2}(R \times S))$$

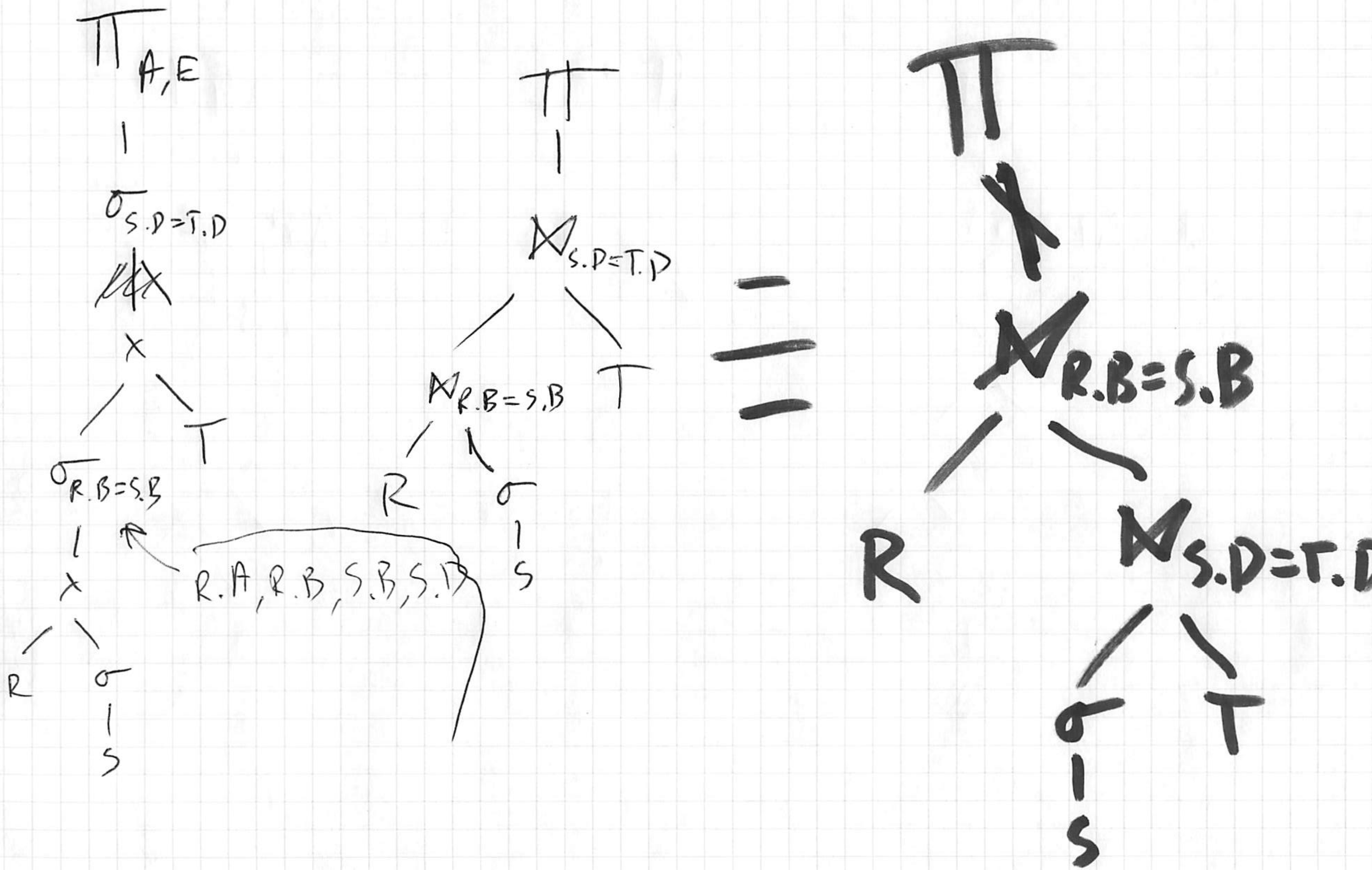
$$\equiv \sigma_{c_2}(\sigma_{c_1}(R \times S))$$

$$\equiv \sigma_{c_2}((\sigma_{c_1}(R)) \times S) \equiv (\sigma_{c_1} R)$$

$$\Pi(\sigma'((R \times S) \times T))$$

$$\Pi_{A,E}(\sigma_{B,D}((R \times (\sigma_C S)) \times T))$$




Π A,E
σ S.D=T.D
×
T
σ R.B=S.B
×
R
σ
S
R.A, R.B, S.B, S.D
Π
⋈ S.D=T.D
⋈ R.B=S.B
T
R
σ
S
=
Π
⋈ R.B=S.B
R
⋈ S.D=T.D
σ
T
S

pick algo

SQL → RA → Plan → Eval

opt

getWhere()

↳ Expression

EvalLib.eval(Expression)

↳ Bool

You implement

eval(Column)

$R.A > 5 \land R.B < 6$