

CSC 742
Database Management Systems
 Topic #7:
Relational Algebra - Supplement

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A Complete Set of Relational Algebra

- The complete set of operations
 - ◆ $\{\sigma, \pi, \cup, -, \times\}$
 - ◆ Any of the other relational algebra operations can be expressed as a sequence of operations from this set.
 - ◆ Examples:
 - ◆ $R \cap S =$
 - ◆ $R \setminus S =$

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Employee			Dependent		
Fname	Lname	SSN	Fname	Lname	ESSN
Alice	Zelaya	999-88-7777	Eric	Zelaya	999-88-7777
Jennifer	Wallace	111-22-3333	Alex	Wallace	111-22-3333
Joyce	White	222-33-4444			

Employee $\bowtie_{\rho(D(Fname, DLname, SSN))}$ Dependent

Fname	Lname	SSN	DFName	DLname
Alice	Zelaya	999-88-7777	Eric	Zelaya
Jennifer	Wallace	111-22-3333	Alex	Wallace
Joyce	White	222-33-4444	NULL	NULL

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Take-home Exercise

- Prove that \cup is not redundant in the set of relational algebra operations $\{\sigma, \pi, \cup, -, \times\}$.

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Faculty	Name	SSN	Rank	Department
	Alice	999-88-7777	Professor	CSC
	Jennifer	111-22-3333	Assistant Prof.	ECE
	Joyce	222-33-4444	Associate Prof.	CSC

Student	Name	SSN	Advisor	Department
	Eric	999-88-7777	Alice	CSC
	Alex	111-22-3333	Jennifer	ECE

Faculty **OUTER UNION** Student

Name	SSN	Rank	Advisor	Department
Alice	999-88-7777	Professor	NULL	CSC
Jennifer	111-22-3333	Assistant Prof.	NULL	ECE
Joyce	222-33-4444	Associate Prof.	NULL	CSC
Eric	999-88-7777	NULL	Alice	CSC
Alex	111-22-3333	NULL	Jennifer	ECE

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Division Operation

- $R(Z) \div S(Z)$, where $X \subseteq Z$. Let $Y = Z - X$.
- The result is a relation $T(Y)$ that includes a tuple t
 - ◆ if tuples t_R appear in R with $t_R[Y] = t$,
 - ◆ and with $t_R[X] = t_S$ for every tuple t_S in S .

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R	A	B	S	A	
	a1	b1		a1	
	a2	b1		a2	
	a3	b1		a3	
	a4	b1			
	a1	b2			
	a3	b2			
	a2	b3			
	a3	b3			
	a1	b4		T	B
	a2	b4			b1
	a3	b4			b4
a3	b4				

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Exercise 3

- Find SSNs of employees who work on all the projects controlled by dept 5.

Employee(Fname, Lname, SSN, Bdate, Address, Sex, Salary, SuperSSN, Dno)

Works_on(ESSN, Pno, Hours)

Project(Pname, Pnumber, Plocation, Dnum)

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Exercise 1

- Find names of employees in the research dept

Employee(Fname, Lname, SSN, Bdate, Address, Sex, Salary, SuperSSN, Dno)

Department(Dname, Dnumber, MgrSSN, MgrStartDate)

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Exercise 2

- For every project in 'Stafford' list the controlling dept number and the dept manager's last name

Employee(Fname, Lname, SSN, Bdate, Address, Sex, Salary, SuperSSN, Dno)

Department(Dname, Dnumber, MgrSSN, MgrStartDate)

Project(Pname, Pnumber, Plocation, Dnum)

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