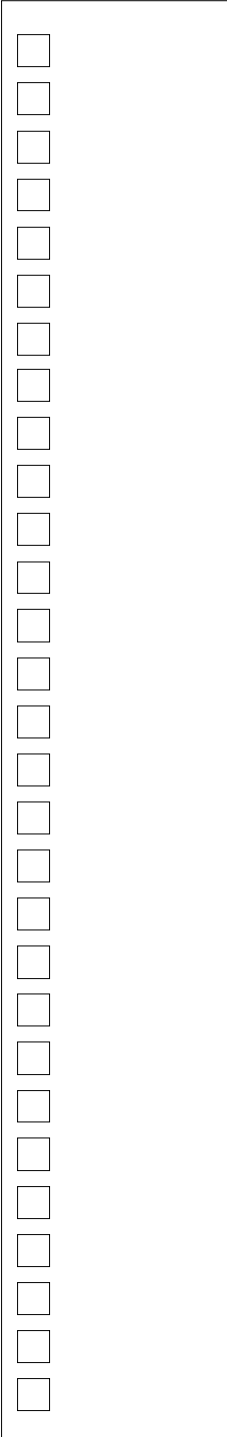


# CSC 742

## Database Management Systems

### Topic #7:

## Relational Algebra - Supplement



**Employee**

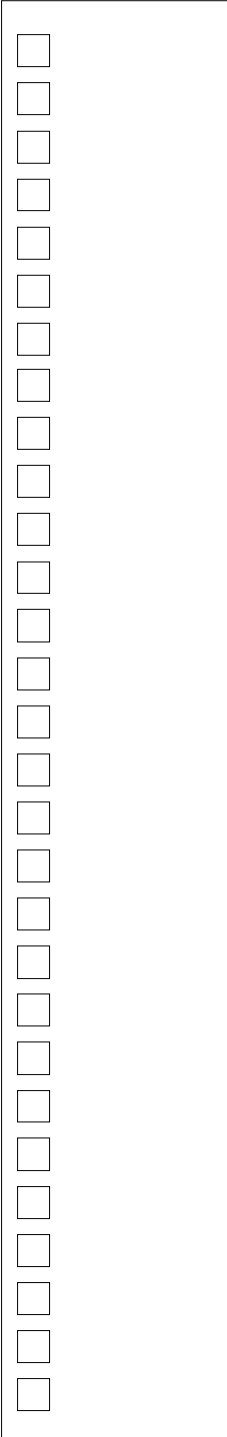
<b>Fname</b>	<b>Lname</b>	<b>SSN</b>
<b>Alice</b>	<b>Zelaya</b>	<b>999-88-7777</b>
<b>Jennifer</b>	<b>Wallace</b>	<b>111-22-3333</b>
<b>Joyce</b>	<b>White</b>	<b>222-33-4444</b>

**Dependent**

<b>Fname</b>	<b>Lname</b>	<b>ESSN</b>
<b>Eric</b>	<b>Zelaya</b>	<b>999-88-7777</b>
<b>Alex</b>	<b>Wallace</b>	<b>111-22-3333</b>

**Employee ]><|  $\rho_{(DFname, DLname, SSN)}$  Dependent**

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



**Faculty**

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

**Student**

<b>Name</b>	<b><u>SSN</u></b>	<b>Advisor</b>	<b>Department</b>
<b>Eric</b>	<b>999-88-7777</b>	<b>Alice</b>	<b>CSC</b>
<b>Alex</b>	<b>111-22-3333</b>	<b>Jennifer</b>	<b>ECE</b>

**Faculty OUTER UNION Student**

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

# 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:

◆  $R \cap S =$

◆  $R \bowtie_{<c>} S =$

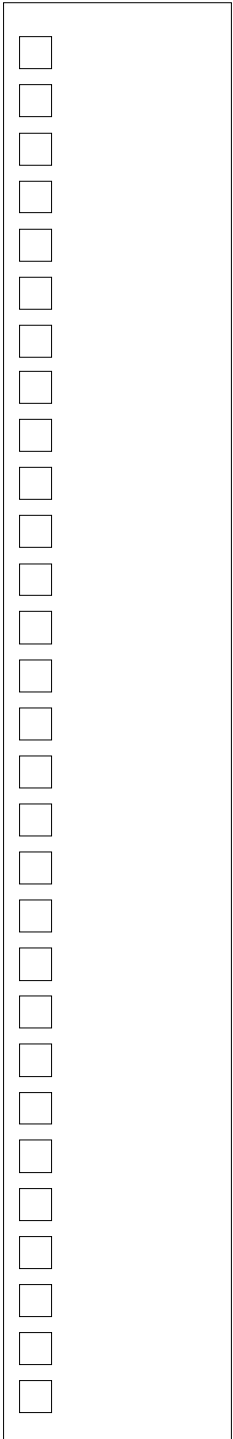


# Take-home Exercise

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

# 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  $S$ .



R

A	B
a1	b1
a2	b1
a3	b1
a4	b1
a1	b2
a3	b2
a2	b3
a3	b3
a1	b4
a2	b4
a3	b4

S

A
a1
a2
a3

T

B
b1
b4

# 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)





# 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)

# 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)