

CSE 132A
Winter 2017

Solutions to Homework 1

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Problem 1

- (a) List the students who have taken all prerequisites for CSE132X with a grade 2 or higher
- (i) tuple calculus with universal quantification:

$$\begin{aligned} & \{s : sid \mid \exists u \in student[s(sid) = u(sid)] \\ & \quad \wedge \forall p \in prerequisite[p(cid) = "CSE132X"] \\ & \quad \rightarrow \exists r \in record[r(sid) = s(sid) \wedge r(cid) = p(precid) \wedge r(grade) \geq 2]\}. \end{aligned}$$

(ii) tuple calculus using only existential quantification:

$$\begin{aligned} & \{s : sid \mid \exists u \in student[s(sid) = u(sid)] \\ & \quad \wedge \neg \exists p \in prerequisite[p(cid) = "CSE132X"] \\ & \quad \wedge \neg \exists r \in record[r(sid) = s(sid) \wedge r(cid) = p(cid) \wedge r(grade) \geq 2]\}. \end{aligned}$$

(iii) SQL:

```
select sid
from student s
where not exists
(select * from prerequisite p
where p.cid = "CSE132X"
AND not exists (select * from record r
where r.sid = s.sid AND p.precid = r.cid
AND r.grade  $\geq$  2))
```

- (b) Find the courses taken by every student who has taken CSE132A
- (i) tuple calculus with universal quantification:

$$\begin{aligned} & \{c : cid \mid \exists u \in course[c(sid) = u(sid)] \\ & \quad \wedge \forall s \in record[s(cid) = "CSE132A"] \\ & \rightarrow \exists r \in record[r(cid) = c(cid) \wedge r(sid) = s(sid)]\}. \end{aligned}$$

(ii) tuple calculus using only existential quantification:

$$\begin{aligned} & \{c : cid \mid \exists u \in course[c(sid) = u(sid)] \\ & \quad \wedge \neg \exists s \in record[s(cid) = "CSE132A"] \\ & \quad \wedge \neg \exists r \in record[r(cid) = c(cid) \wedge r(sid) = s(sid)]\}. \end{aligned}$$

(iii) SQL:

```
select c.cid  
from course c  
where not exists  
(select * from record s  
where s.cid = "CSE132A"  
AND not exists (select * from record r where r.cid = c.cid AND r.sid = s.sid))
```