Name: _____

1. (1 pt.)
   - **Read all material carefully.**
   - *If in doubt whether something is allowed, ask, don't assume.*
   - You may refer to your books, papers, and notes during this test.
   - E-books may be used *subject to the restrictions* noted in class.
   - No computer or network access of any kind is allowed (or needed).
   - Write, and draw, carefully. Ambiguous or cryptic answers receive zero credit.
   - Use class and textbook conventions for notation, algorithmic options, etc.

   Write your name in the space provided above.

R_1

B	N	C	D
Neville	227	30	cramped seating, blackboard
Neville	120	25	nice chairs, whiteboard, videoconferencing
Neville	225	2	office
Neville	224	3	office
East Annex	225	10	lab
East Annex	227	3	office

2. (8 pts.) Evaluate the following queries on the database instance depicted above.

   (a)
```
select distinct P.B, P.N
from R1 P, R1 Q
where P.C = 10
```

   (b)
```
select P.B, P.N
from R1 P, R1 Q
where P.C = 10 and P.N > Q.N
```

3. (12 pts.) Let R_1 be the relation depicted earlier. For each of the following (separately) either provide a relation S with the indicated property and justify the claim or explain why no such relation exists.

   (a) $R_1 \cup S = R_1$

   (b) $R_1 \cup S = S$

   (c) $R_1 \times S = R_1$

   (d) $R_1 \times S = S$

4. (4 pts.) Each room is identified by its building and number. Write SQL queries for the rooms in *Neville* with the maximum capacity.

5. (5 $\star$ pts.) Is there is a relational algebra query that is equivalent to the query of Question 4 and that uses only the operators $\cup$, $-$, $\times$, π, and σ discussed in class? If so, provide the query and justify the equivalence claim; otherwise, explain why no such query exists.