| $\operatorname{COS} 480 / 580$ Fall 2019 Class Exercise 2 | 5 questions; 2 pgs. 2019-09-11 |
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Today: Relational model (contd.). § 2.*.
Next class: Catch-up, review. §§ 1.*,2.*.
Reminders: Quiz 01 soon. Newsgroup. Syllabus. Reading.

1. List the members of your group below. Underline your name.
2. Consider a database with relations Students(id, name, year), Courses(id, title, ta), and Enrolls (student, course, credits). A tuple $(i, n, y) \in \operatorname{Students}$ denotes a student with student-identifier $i$, name $n$, and year $y$. A tuple $(i, t, a) \in$ Courses denotes a course with course-identifier $i$, title $t$, and whose teaching assistant's studentidentifier is $a$. A tuple $(s, c, r) \in$ Enrolls denotes the enrollment of the student with identifier $s$ in the class with identifier $c$, for $r$ credits.
We say student $t$ is a TA of student $s$, for $r$ credits, if $s$ is enrolled for $r$ credits in a course whose TA is $t$. We say a TA $t$ is responsible for $r$ credits if $r$ is the sum of credits of all student enrollments in all courses whose TA is $t$.
Write an extended algebra query for the names and IDs of the TAs who are the TAs of the maximum number of students for $r$ credits, for each distinct value of $r$ occurring in the database.
3. Prove or disprove: Bag intersection may be expressed using bag union and difference.
4. Provide formal definitions of each of the bag algebra operators: selection, projection, cross product, union, difference.
5. Provide expressions for the minimum and maximum cardinalities of the result of each of the operators of Question 4 as a function of the cardinalities of its operands. Justify your answers.
