



# Query Optimization

## 1. Exercise, Summer 2009

Due 2009-04-29.

Consider the following database instance:

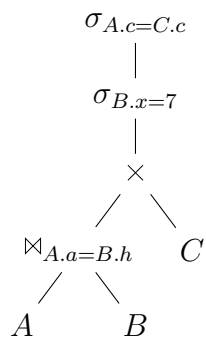
Professors		Students		Exams			Attended	
PID	Name	SID	Name	LID	SID	Grade	LID	SID
2156	Ranieri	6548	Feuerbach	0	6548	1.0	0	6548
5488	Zimmermann	9844	Petrov	12	9844	1.0	5	6548
5485	Autexier	8455	Weber	5	6548	1.3	5	8455
5420	Chiusi	1657	Lui	16	5448	2.7	0	8455
2088	Herberger	5448	Schumann	12	9844	3.3	16	5448
...		...		...			...	

Lectures		
LID	Name	givenBy
0	Programming Languages	5488
12	Banking	5485
5	Statistics	5420
16	Algorithms and Data Structures	5420
12	Algebraic Geometry	5420
...		

1. Use relational algebra to construct a plan (not necessary optimal) for each of the following queries. Present these plans as trees.
  - (a) Find all lectures given by Prof. Chiusi.
  - (b) Give a list of students attending a lecture by Prof. Chiusi.
  - (c) Determine the average grade of each student from the result list from 1.b.
  - (d) Find the best exam of each student.
  - (e) Find all students that attended all lectures by Prof. Chiusi.

2. Consider the following algebraic expressions. Improve them (with a short justification).

(a)



(b)

