UNIVERSITY OF UTAH, COMPUTER SCIENCE DEPARTMENT

Written Assignment #1
CS 6530 Fall 2016

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1. **Problem 1.** Relational Algebra [28pts] Consider the dvdrental schema from the dvdrental database on our database server: `http://www.postgresqltutorial.com/postgresql-sample-database/`. Answer the following queries in relational algebra:

   a) Find the customer ids who have rented all films.

   The customer ids who have rented all films can be found by dividing a relation containing customer id and film rentals for the customer, by a relation containing all film ids. Let $R1$, $I1$ and $F1$ be instances of the rental, inventory and film relations. The following will give the customer ids who have rented all films.

   $\pi_{customer\_id,film\_id}(R1 \bowtie_{R1.inventory\_id=I1.inventory\_id} I1)/\pi_{film\_id}(F1)$

   b) Print the store id and the phone number for each store that has only one staff member.

   c) Find every pair of customer and staff who are from the same city, by listing their customer id and staff id.

   d) Find the customer ids who *have rented all and only those* films acted by Emily Dee.

2. **Problem 2.** [28pts] Answer following queries using Tuple Relational Calculus.

   a) Find the customer ids who have rented all films.

   b) Print the store id and the phone number for each store that has only one staff member.

   c) Find every pair of customer and staff who are from the same city, by listing their customer id and staff id.

   d) Find the customer ids who *have rented all* films acted by Emily Dee (slightly modified from Problem 1).