40 points total; due Monday 28 October.

Solve the following exercises:

1. (7 points per part) Exercise 3.3.1 parts (a) and (b) on pp 92-93. For both parts, please also list all 3NF violations. You do not need to do a decomposition for the 3NF violations, however.

2. Consider the following relation and its functional dependencies:

   \[ R(A, B, C, D) \]
   \[ A \rightarrow B, C, D \]
   \[ B \rightarrow D \]

   Your pointy-haired boss has suggested decomposing it into the following two relations:

   \[ R1(A, B) \]
   \[ R2(B, C, D) \]

   (a) (5 points) Show which FDs are preserved by this decomposition, and which are not.

   (b) (6 points) Use the chase algorithm to show whether or not the proposed join is lossless. Explain why your resulting tableau proves or disproves the lossless join property (i.e., I want you to do more than just say, “I saw X in the tableau, so it is/isn’t lossless;” I want you to explain what such a result implies about the original relation and the decomposition).

3. (10 points) Exercise 3.5.2 on p. 105.

4. (5 points total) Exercise 3.6.1 on pp. 113-114.