Exercise 1,2,3

1

(a) $C \to B$
$AC \to B$
$A \to B$

(b) $\alpha \to \beta, \beta \subseteq \alpha \Rightarrow \alpha \to \beta \ \cup \ \gamma$
$\alpha \to \gamma$
$\alpha \to \beta \Rightarrow \alpha \ \cup \gamma \to \beta \cup \ \gamma, because\ \gamma \subseteq \alpha, then\ \alpha \ \cup \gamma \to \alpha, then\ \alpha \to \beta \cup \gamma$

(c)

α	β	γ
a_1	b_1	c_1
a_2	b_1	c_1
a_3	b_1	c_1

2

(a)

x_i	$\alpha_i \to \beta_i$
lectureId, studentId	$lectureId \to topicprofessorId$
lectureId, studentId, topic, professorId,	$professorId \to office$
lectureId, studentId, topic, office, professorId	$studentId \to studentName$
lectureId, studentId, topic, office, professorId,studentName	$lectureId, studentId \to grade$
lectureId, topic, professorId, office, studentName, grade, studentId	

Minimal keys are **lectureId** and **studentId**

(b)

x_i	$\alpha_i \to \beta_i$
playerId	$playerId \to club, jerseyNumber, name, b$
club, jerseyNumber, playerId, name, birthdate	$club \to founded$
club, founded, jerseyNumber, palyerId, name, birthdate	

3

(a.i) R = A,B,C,D,E,F,G,H,I,J
F = $C \to BH, I \to DG, J \to C, AJ \to E, A \to FI$

x_i	$\alpha_i \to \beta$
A,J	$A \to FI$
A,F,I,J	$J \to C$
A,C,F,I,J	$C \to BH$
A,B,C,F,H,I,J	$I \to DG$
A,B,C,D,G,H,I,J	$AJ \to E$
A,B,C,D,E,F,G,H,I,J	

A,J are minimal keys

(a.ii) $R_1\{\underline{A}, F, \underline{I}, D, G\}$ $R_2\{\underline{J}, \underline{C}, B, H\}$ $R_3\{\underline{A}, \underline{J}, E\}$

(a.iii) $R_{11}\{\underline{A}, F, I\}$ $R_{12}\{\underline{I}, D, G\}$ $R_{21}\{\underline{J}, C\}$ $R_{22}\{\underline{C}, B, H\}$ $R_3\{\underline{A}, \underline{J}, E\}$

This R is in BCNF, because all FDs are implied by its key constrains

(b) BCNF is violated because of $MVP \to Team$ dependency. Relations $R_1\{Matchday \to Team\}$, $R_2\{Team \to MVP\}$ is in BCNF