Worksheet 7: Normalization

Question 1: You are given an instance and the following rules for a relation called Tutor. Assume that the key is (StudentName, Course).

- A tutor charges the same tuition fees from all students
- A tutor can teach only one course (e.g. Ritu can teach only 1 subject (Math))
- A student can be taught a course by one tutor only.

StudentName	StudentYearOfBirth	Course	Tutor	TuitionFees (per hour)
Harry	2005	Math	Ritu	$25
Ellen	2008	Physics	Dan	$35
Ansh	2005	English	Larry	$40
Gloria	2006	Math	Ritu	$25
Harry	2005	Computer Science	Christie	$30

1a. The following statements are written to add more data to the existing relation Tutor. Which of the following statement or statements describe an insertion anomaly:

Statement1: Gary was born in 2000.

Statement2: Gary is taught Math by Ritu.

Statement3: Cathie charges $30 per hour to teach Math.

1b. Find all functional dependencies of Tutor.

(Student, Course) → Tutor
(Student, Course) → TuitionFees
(Student, Course) → StudentYearOfBirth

StudentName → StudentYearOfBirth

Tutor → TuitionFees
Tutor → Course

1c. Is Tutor in 1NF? Justify.

No because Tutor has at least one non-fully functional dependency.

1d. Is Tutor in 2NF? Justify.

No because Tutor is not in 1NF.

Question 2: Given CUSTOMER (CustomerID, Name, Street, City, State, Zip, Phone)

CustomerID	Name	Street	City	State	Zip	Phone
C101	Smith Harry	123 RidgeLand	Oakville	ON	L9M 2P4	416-555-1212
C102	Arthur Weasly	11 Nova Street	Sherbrooke	PQ	J1C 0A1	819-555-1212

a. List all non-full functional dependencies in CUSTOMER, if any.
b. Prove that CUSTOMER is in 2NF.
c. Is CUSTOMER in 3NF? If not, decompose it into smaller relations such that the resulting relations are in 3NF.

a. None

b. Customer is not in 2NF because Customer has at least one non-fully functional dependency. Thus, Customer is not in 2NF.

c. Customer is not in 3NF