CS 464/564 Spring 2021 Quiz 4 **Name:** Ethan Booker

1. Suppose a new table called CustomerBill has been added to the Library database. The create table statement for the table is shown below.

create table CustomerBill(billNum serial primary key, amount money, billDate date, cid int not null, foreign key(cid) references Customer(cid))

Write a stored procedure called makeBill that is passed a customer id, a start date and an end date. The procedure calculates the total fines the customer owes between the start date and the end date inclusive and generates a new CustomerBill row for that customer. The billDate value for the new row is the current date. For example if a call to makeBill is passed customer id 10 and the dates 2021-02-01 (February 1, 2021) and 2021-02-28 and customer 10 has fines of $1.00, $0.75 and $2.25 for books returned on 2021-02-01, 2021-02-12 and 2021-02-28 respectively then the procedure inserts a row into the CustomerBill table containing the values (4.00, 2021-03-05, 10) (assuming March 5, 2021 is the current date). Remember since billNum is of type serial a value will be assigned to the billNum attribute of the new row by the database.

```
CREATE OR REPLACE FUNCTION makeBill(customer_id integer, start date, end date)
RETURNS money AS $$
DECLARE
    totalFines money;
BEGIN
    SELECT SUM(fine) INTO totalFines FROM Customer NATURAL JOIN Loan WHERE Customer.cid = customer_id AND
    Loan.ret BETWEEN start AND end GROUP BY Customer.cid;
    INSERT INTO CustomerBill (amount, billDate, cid) VALUES (totalFines, CURRENT_DATE, customer_id);
    RETURN totalFines;
END;
$$ LANGUAGE plpgsql;
```

2. Let the Universal table be R = {A, B, C, D, E, F, G, H}

Let FD = {AE -> B, B -> C, C -> D, CF -> DE, CH -> D, D -> E, DE -> F, EFG -> D, F -> G, FH -> C} be the functional dependency set

A. What is the closure of ABH?

ABH+ = ABH, C, D, E, F, G

B. Is ABH a super key?

Yes, ABH+ contains all attributes in relation R

C. Is ABH a key? Why?

Yes, because no proper subset of ABH has the super key property. You can quickly check this because AH does not appear on the RHS and AH does not have super key property thus ABH is a key.