Relation Algebra Example Question

Relations:

Note: **Bold text** represents primary key, wavy line represents foreign key.

$Branch(\textbf{bid}, address, city, manager\_name, opening\_hours, has\_atm)$

$Customer(\textbf{cid}, first\_name, last\_name, address, date\_joined)$

$Loan(\textbf{loan\_id}, amount, date, term, cid, bid)$

$Account(balance, cid, bid)$ 2 foreign keys as primary key

Questions:

1. The names of all branch managers in Vancouver:

$\pi_{manger\_name}(\sigma_{city=Vancouver}(Branch))$

2. The dates of all loans by customers with the name 'Anita Borg'

$R_{customerloans} = Loan \bowtie Customer$

$\pi_{date}(\sigma_{first\_name="Anita" \wedge last\_name="Borg"}(R_{customerloans}))$

3. The names of all people who have loans of more than \$10,000

$\pi_{first\_name, \ last\_name}(\sigma_{amount \ > \ 10,000}(R_{customerloans}))$

Note: $R_{customerloans}$ is from above

4. The names of all people who have accounts in Toronto and loans of more than \$5,000

$R_{toronto\_loans} = (Branch \bowtie_{city=Toronto} Loan) \bowtie Customer$

$\pi_{first\_name, \ last\_name}(\sigma_{amount \ > \ 5,000}(R_{toronto\_loans}))$

5. The names of all people who have accounts in Toronto but do not have any loans

$R_{tornto\_accounts} = (\sigma_{city=Toronto}(Branch)) \bowtie Customers \bowtie Account$

$\pi_{first\_name, \ last\_name}(R_{toronto\_accounts} \bowtie (\sigma_{cid}(R_{toronto\_accounts}) - \sigma_{cid}(Loan)))$

6. The names of all people who have a loan of more than \$10,000 and a loan of less than \$1,000

$R_{loan\_10,000} = Customer \bowtie_{Customer.cid \ = \ Loan.cid} (\sigma_{amount>10,000} Loan)$

$R_{loan\_1,000} = Customer \bowtie_{Customer.cid \ = \ Loan.cid} (\sigma_{amount<1,000} Loan)$

$\pi_{first\_name,last\_name}(R_{loan\_1,000} \ \wedge \ R_{loan\_10,000})$