**1. Using the following relations:**

**product ( pno, pname, man)**

**pno – product number**

**pname – product name**

**man – manufacturer identification number**

**manufacturer ( manno, mname, tickerno )**

**manno – manufacturer identification number**

**mname – manufacturer name**

**tickerno – stock market identification code**

**For each of the following, give the relational algebra (6 points each), tuple relational calculus (5 points each) and domain relational calculus (3 points each) notion for each.**

**a. Find the pno for all products.**

Relational Algebra:

Πpno(product)

Tuple Relational Calculus:

{m | ∀ n ε product(m[pno] = n[pno])}

Domain Relational Calculus:

{<t>| ∀ t, pno, man(<t, pno, man> ε product )}

**b. Find all tuples in product where pname = “eraser”**

Relational Algebra:

Πpno,pname,man(σpname=”eraser”(product))

Tuple Relational Calculus:

{m | ∃ n ε product(m[pno] ∧ n[pname]=”eraser”)}

Domain Relational Calculus:

{<t,man>| ∃ t, pname, man(<t, pname, man> ε product ∧ pname = “eraser”)}

**c. Find the pno and tickerno for all products.**

Relational Algebra:

Πpno,tickerno(σ product.man = manufacturer.manno(product X manufacturer))

Tuple Relational Calculus:

{m | ∃ n ε product(m[pno] = n[pno] ∧ (∃ x ε manufacturer(m[man] = [manno]))}

Domain Relational Calculus:

{<p,t>| ∀ p, pno, man(<p, pno, man> ε product) ∧ (<ma, mn, t> ε manufacturer ))}

**2. Write the SQL code for division. Try to do it without using the EXCEPT clause. If you cannot figure it out, I will accept the EXCEPT clause with a slight deduction in points. There are no tables for this assignment, so you make up table and entity names if necessary, for your code. (8 points)**

Select distinct m.pno from r as m where not exists

(select \* from s as x where not exists

(select \* from r as n where (n.pno = m.pno) and (n.man=x.man)));