Date:
Name 1:
Name 2:

Answer the following questions in both relational algebra and SQL. The SQL must match the Relational Algebra. You can only use the operators discussed in class today.

Assume the following schema:

> Classes(<u>class</u>, type, country, numGuns, bore, displacement)
> Ships(<u>ship</u>, class, launched)
> Battles(<u>battle</u>, date)
> Outcomes(<u>ship</u>, <u>battle</u>, result)

a) List the class name and country for all classes with at least 10 guns.

$\Pi_{class, country}\ \sigma_{numGuns >= 10}\ Classes$

```
select class, country from Classes where numGuns >= 10;
```

b) List the ships (entire tuples) launched before 1918 (attribute *launched* is a year)

$\sigma_{launched < 1918}\ Ships$ | Also valid $\Pi_{ship}\ \sigma_{launched < 1918}\ Ships$

```
select * from Ships where launched < 1918;
```

c) List all the ships (entire tuples) that have the same name (attribute *ship*) as their class

$\sigma_{ship = class}\ Ships$

```
select * from Ships where ship = class;
```

d) List the ***ship*** and **class** of ships that where sunk (result = 'sunk')

$\Pi_{ship, class}\ \sigma_{ship\ IN\ (\Pi_{ship}\ \sigma_{result = 'sunk'}\ B)}\ S$

```
select ship, class from Ships
where ship IN (select ship from Outcomes where result = 'sunk');
```