1. (20 points) Write the SQL statements to create tables corresponding to the given relation. Use your best judgment for determining the sizes of the strings.

$$\texttt{Executive}(\texttt{id}:\texttt{int},\ \texttt{name}:\texttt{string})$$
$$\texttt{Studio}(\texttt{id}:\texttt{int},\ \texttt{name}:\texttt{string},\ \texttt{president}:\texttt{int})$$
$$\texttt{Movie}(\texttt{title}:\texttt{string},\ \texttt{year}:\texttt{int},\ \texttt{genre}:\texttt{string},\ \texttt{studio}:\texttt{int})$$

2. (20 points) The following queries all contain at least one error (not syntactic errors, errors pertaining to the domains of the operators). Write next to each query at least one of the errors you have identified. (You may assume that the tables and columns referenced by the queries exist.)

  (a) $\pi_{A,B,C}(\rho_{C=Z}(\pi_{A,B,C}(X)))$

  (b) $\pi_{A,B,C}(X)\ \cup\ \pi_{D,E,F}(Y)$

  (c) $\pi_{A,B,C}(X)\ \bowtie\ \pi_{D,E,F}(Y)$

3. (20 points) Translate the following relational algebra queries into SQL queries which give equivalent results.

  (a) $\rho_{C=Z}(\pi_{A,B,C}(\sigma_{A<100,100<B}(X)))$

  (b) $\pi_{A,B,C}(X)\ \cup\ \pi_{A,B,C}(Y)$

  (c) $\pi_{A,B,C}(X)\ \bowtie\ \sigma_{A<10}(\pi_{A,E,F}(Y))$

Use the relations below in the following problems.

$$R \equiv \begin{array}{cc} \textbf{A} & \textbf{B} \\ \hline 9 & 1 \\ 5 & 4 \\ 3 & 2 \end{array}$$

$$S \equiv \begin{array}{cccc} \textbf{D} & \textbf{B} & \textbf{E} & \textbf{F} \\ \hline 2 & 1 & 8 & a \\ 4 & 4 & 4 & g \\ 8 & 4 & 2 & i \end{array}$$

$$T \equiv \begin{array}{cc} \textbf{X} & \textbf{Y} \\ \hline g & j \\ a & b \\ d & e \\ g & h \end{array}$$

4. (20 points) Give a relational algebra query and a SQL query which gives each row of R where the value of $R.A$ is greater than 3, paired with each row of S paired with the rows of T where $S.F$ and $T.X$ are equal, and where $R.A$ has been renamed G.

The results of your queries should match the table:

G	B	D	B	E	F	X	Y
9	1	2	1	8	a	a	b
9	1	4	4	4	g	g	h
9	1	4	4	4	g	g	j
5	4	2	1	8	a	a	b
5	4	4	4	4	g	g	h
5	4	4	4	4	g	g	j

5. (20 points) Give a relational algebra query and a SQL query which pairs each element of the union of $R.A$ and $R.B$, where the value is greater than 2, with the elements of $T.X$; and where the component containing elements of the union of $R.A$ and $R.B$ is named Z.

The results of your queries should match the table:

Z	X
4	g
9	g
5	g
3	g
4	a
9	a
5	a
3	a
4	d
9	d
5	d
3	d
4	g
9	g
5	g
3	g