1. 1. min: r ($S \subseteq R$), max: $r + s$ (no duplicates)
   2. min: 0 (no common B), max: rs (everything joins)
   3. min: 0 (no $S.B$ in $R.B$), max: r (take $R = S$ where $R.B$ are all distinct)
   4. min: 0 ($R.B$ NULL), max: r (no NULL)
   5. min: 0 ($R.B$ all same values), max r (no same $R.B$ values)

2. 1. NO; (a) only gets rid of tuples where both $R.A = S.A$ and $R.B = S.B$, (b) gets rid of tuples where $R.A = S.A$.
   2. YES (both are natural joins on A)
   3. YES
   4. YES
   5. NO; EXCEPT removes duplicates.
   6. NO; (b) counts those that satisfy both conditions twice.

3. $\Pi_{R.A,R.B}(\sigma_{R.A=S.A \wedge R.B=S.B}(R \times S))$

4. The result is $\{(1, 3), (2, NULL)\}$;
   "FROM R, S WHERE $R.B = S.B$" gives us $\{(1, 1, 1, 3), (1, 1, 1, NULL), (1, 2, 2, NULL)\}$ by matching all rows where $R.B = S.B$, ignoring $NULL$ ones since they cannot be compared so those comparisons will return false. Note: the columns here are in the order of $R.A, R.B, S.B, S.C$.
   "GROUP BY $A, S.B$" gives us two groups $\{(1, 1, 1, 3), (1, 1, 1, NULL)\}$ and $\{(1, 2, 2, NULL)\}$ by grouping rows where A and $S.B$ match.
   Finally "SELECT $S.B$, AVG(C)" returns $(1, 3)$ and $(2, NULL)$ as AVG ignores null rows when calculating the average of each group.

5. 1. FALSE
   2. FALSE
   3. TRUE
   4. TRUE
   5. FALSE