1. Explain two reasons why hash joins are preferred over sort-merge joins in today’s database systems.

2. One of the main innovations of VectorWise over MonetDB was use of a vectorized execution model. Explain how this model strikes a balance between MonetDB’s approach and tuple-at-a-time processing, and its main pros and cons.

3. Briefly explain two advantages of late materialization and why it may sometimes be slower than the alternative.

4. Consider the following query with an EXCEPT over two relations: \( R(A, B) \) and \( S(A, C) \).

\[
\text{(select A from R where B = 10)}
\text{EXCEPT}
\text{(select A from S where C = 10)}
\]

Rewrite this query to a single-block query by first converting it to a two-block query (with a subquery), and then converting it into a single-block query. Suggest a general approach to handling such queries. Keep in mind that EXCEPT eliminates duplicates by default. Suggest reasons why such a rewrite may give large performance improvements.

5. Briefly explain in your words the idea of “using semijoin-like techniques for optimizing multi-block queries” (Section 4.3, Chaudhuri paper).