1. Let’s discuss each feature in detail:
   - A security facility is necessary because Scrooge does not plan to share his list with anyone else. Even though he is running it on his stand-alone PC, a rival duckster could break in and attempt to query his database. The database’s security features would foil the intruder.
   - Concurrency control is not needed because only he uses the database.
   - Crash recovery is essential for any database; Scrooge would not want to lose his data if the power was interrupted while he was using the system.
   - A view mechanism is needed. Scrooge could use this to develop “custom screens” that he could conveniently bring up without writing long queries repeatedly.
   - A query language is necessary since Scrooge must be able to analyze the dark secrets of his victims. In particular, the query language is also used to define views.

2. The architecture of a relational DBMS typically consists of a layer that manages space on disk, a layer that manages available main memory and brings disk pages into memory as needed, a layer that supports the abstractions of files and index structures, a layer that implements relational operators, and a layer that parses and optimizes queries and produces an execution plan in terms of relational operators. In addition, there is support for concurrency control and recovery, which interacts with the buffer management and access method layers. The disk space management layer has to be rewritten to take advantage of the new functions on OS files. It is likely that the buffer management layer will also be affected.

3.

3.1