1. Exercize 12.4 in your text (page 356).

2. Exercize 14.8 in your text (page 409).

3. Consider the following SQL query

   ```sql
   SELECT ROADID
   FROM ROADS R, ZONES z1, ZONES z2
   WHERE R.SRCZONE = z1.ZONEID AND R.ENDZONE = z2.ZONEID AND
     z1.TYPE = 'R' AND z2.TYPE = 'C' AND R.DIST < 10
   ```

   (a) Translate this query into an RA expression, using the naive translation algorithm given in class.

   (b) Use the rule-based method developed in class to transform the RA expression you obtained in (a) into an optimized RA expression. If you make any assumptions (e.g. about the size of the relations involved), state these clearly.

4. Exercize 18.4 in your text (page 539).

5. Discuss how the recovery algorithm given in class changes if there is no available cache. For example, is a log still required in this situation?

6. Rewrite the UNDO/REDO recovery algorithm given in class assuming no transactions can abort. Assume no deadlock occurs (so you only need consider system failures).