Questions

1. (24 points) Consider the set of rights \{ read, write, execute, append, list, modify, own \}.
   (a) Using the syntax in Section 2.3, write a command \texttt{delete\_all\_rights}(p, q, o). This command causes \( p \) to delete all rights the subject \( q \) has over an object \( o \).
   (b) Modify your command so that the deletion can occur only if \( p \) has \texttt{modify} rights over \( o \).
   (c) Modify your command so that the deletion can occur only if \( p \) has \texttt{modify} rights over \( o \) and \( q \) does not have \texttt{own} rights over \( o \).

2. (20 points) The proof of Theorem 3.1 states that we can omit the \texttt{delete} and \texttt{destroy} commands as they do not affect the ability of a right to leak when no command can test for the absence of rights. Justify this statement. If such tests were allowed, would \texttt{delete} and \texttt{destroy} commands affect the ability of a right to leak?

3. (20 points) Prove or disprove: The claim of Lemma 3.1 holds when \( x \) is an object.

4. (20 points) Consider the construction of the three-parent joint creation operation from the two-parent joint creation operation shown in Section 3.5.2. Suppose we set \( cr_c(s,c) = c/R_3 \) and \( link_2(S,A_3) = A_3/t \in \text{dom}(S) \). Why is this not sufficient to derive the three-parent joint creation operation from the two-parent joint creation operation?

5. (16 points) Classify each of the following as an example of a mandatory, discretionary, or originator controlled policy, or a combination thereof. Justify your answers.
   (a) The file access control mechanisms of the UNIX operating system
   (b) A system in which no memorandum can be distributed without the creator’s consent
   (c) A military facility in which only generals can enter a particular room
   (d) A university registrar’s office, in which a faculty member can see the grades of a particular student provided that the student has given written permission for the faculty member to see them.