

# Homework #1

Due: April 10, 2026

Points: 100

## Questions

- (15 points) Is it possible to design and implement a system in which no assumptions about trust are made? Why or why not?
- (20 points) Suppose Alice has  $r$  and  $w$  rights over the file *book*. Alice wants to copy  $r$  rights to *book* to Bob.
  - Assuming there is a copy right  $c$ , write a command to do this.
  - Now assume the system supports a copy flag; for example, the right  $r$  with the copy flag would be written as  $rc$ . In this case, write a command to do the copy.
  - In the previous part, what happens if the copy flag is *not* copied?
- (15 points) A reference monitor requires three properties: that it be *simple*, that it be *complete* (always invoked), and that it be *tamperproof*. Explain why these three properties are necessary.
- (25 points) The proof of Theorem 3.1 states the following: Suppose two subjects  $s_1$  and  $s_2$  are created and the rights in  $A[s_1, o_1]$  and  $A[s_2, o_2]$  are tested. The same test for  $A[s_1, o_1]$  and  $A[s_1, o_2] = A[s_1, o_2] \cup A[s_2, o_2]$  will produce the same result. Justify this statement. Would it be true if one could test for the absence of rights as well as for the presence of rights?
- (25 points) Reverse the edge between **d** and **e** in Figure 3-4(a) so there is an edge labeled  $g$  from **d** to **e**. Is  $\text{can\_share}(r, \mathbf{x}, \mathbf{z}, G_0)$  still true? If so, please show a witness; if not, please prove it does not hold.

## Extra Credit

Remember that extra credit scores are *not* added to your homework score. They are recorded separately and used to determine whether to boost your grade if the score is on a borderline.

- (25 points) The Take-Grant Protection Model provides two rights, *take* and *grant*, that enable the transfer of other rights. SPM's *demand* right, in many ways analogous to *take*, was shown to be unnecessary. Could *take* similarly be dropped from the Take-Grant Protection Model?