Homework

1. Come up with the spec for readSentinel that says that r is a head of the stack.

2. Write the proof outline for pop, without looking into lecture notes.

3. Specify and verify the snapshot algorithm given below.

   $$\text{snapshot}(\cdot) : A \times A = (vx,tx_1) \leftarrow !x;$$
   $$vy \leftarrow y;$$
   $$(_,tx_2) \leftarrow !x;$$
   $$\text{if } tx_1 == tx_2 \text{ then return } (vx,vy) \text{ else } \text{snapshot}(\cdot)$$

Snapshot operates over the data structure consisting of two pointers x and y, which can be independently changed by concurrent threads. Snapshot returns the values of x and y, but makes sure that the returned values actually resided in the memory together, and have not been changed by interfering threads in the middle of the snapshoting. Snapshot recognizes such situations by keeping a timestamp with x, which is incremented upon every modification of x. It then sandwiches the read of y in between two reads of x. If the two obtained timestamps of x are equal, the read values of x and y resided in memory together, and can be returned.