Discussion questions:

1. In the vector-space formalism of quantum mechanics, an experiment corresponds to some basis in the space of state vectors, and each possible measurement outcome corresponds to a basis vector in this basis. Usually it is required that the basis be *orthonormal*. Why is this? Discuss both the "ortho" and the "normal" part. (Note: there are numerous generalizations and extensions of this formalism which involve non-orthogonal bases or *matrices* rather than vectors, and which are often more useful in treating real-life experiments, but we will mostly just stick to idealized measurements and orthonormal bases in this course.)

2. Suppose you want to perform a different experiment or measurement than the one corresponding to the basis you started with. How do you describe this in the quantum vector space formalism? Can you think of some kind of connection between what you do with mathematical formalism and what you *physically* do to your experimental setup when switching from one type of measurement to the other.

3. If you wanted to, you could also express *classical* systems in the vector state formalism by saying that each possible outcome of an experiment corresponds to a basis vector and let the vector space be the one spanned by all these basis vectors. If you look at it this way, what is the crucial difference between quantum and classical physics?

4. Continuing along the lines of the previous question, if you treat a classical system using a vector space formalism, could you construct a no-cloning theorem for classical systems, i.e. is it possible to make exact copies of the states of classical systems? What is it about the proof for the quantum non-cloning theorem that needs to be modified or doesn't carry over into the classical case?