3.3 **GHZ-Mermin violation of local realism.** Consider the three-qubit state

$$|\Psi\rangle = \frac{1}{\sqrt{2}}\big(|000\rangle - |111\rangle\big) \,,$$

which is called the *Greenberger-Horne-Zeilinger* (GHZ) state.

(a) *Show* that the GHZ state is a $+1$ eigenstate of $X \otimes Y \otimes Y$, $Y \otimes X \otimes Y$, and $Y \otimes Y \otimes X$.

(b) Use the results of part (a) to argue that each qubit has well-defined values of X and Y. For qubit j, denote these values by x_j and y_j. We say that these values are *elements of reality*. What does local realism, i.e., the assumption of realistic values that are undisturbed by measurements on other qubits, predict for the product of the outcomes of measurements of X on each qubit?

(c) What does quantum mechanics predict for the product of the outcomes of measurements of X on each qubit?