

Ket Practice

Physics II: Modern Physics
College of the Atlantic

1. Let $|\psi\rangle = 3|+\rangle + 4|-\rangle$. Evaluate the following:

- (a) $\langle +|\psi\rangle$
- (b) $\langle -|\psi\rangle$
- (c) $\langle \psi|\psi\rangle$

2. Let $|\psi\rangle = |+\rangle - i|-\rangle$. Evaluate the following:

- (a) $\langle +|\psi\rangle$
- (b) $\langle -|\psi\rangle$
- (c) $\langle \psi|\psi\rangle$

3. Let $|\psi\rangle = C(|+\rangle + i|-\rangle)$. Find the C that makes $\langle \psi|\psi\rangle = 1$.

4. Let $|\psi\rangle = C(-3i|+\rangle + 2|-\rangle)$. Find the C that makes $\langle \psi|\psi\rangle = 1$.

5. Suppose an atom is in a state described by

$$|\psi\rangle = \frac{3}{5}|+\rangle + \frac{4}{5}|-\rangle. \quad (1)$$

- (a) If one performs a z-spin measurement on this atom, what is the probability that the result would be +1?
- (b) If one performs a z-spin measurement on this atom, what is the probability that the result would be -1?

6. The x states are given by:

$$|+\rangle_x = \frac{1}{\sqrt{2}}(|+\rangle + |-\rangle). \quad (2)$$

$$|-\rangle_x = \frac{1}{\sqrt{2}}(|+\rangle - |-\rangle). \quad (3)$$

- (a) What is ${}_x\langle x|-\rangle_x$?
- (b) Verify that ${}_x\langle x|-\rangle$ is what it should be.