1 Finding Orthogonal Vectors

Consider the three quantum states:

$$|\psi_1\rangle = \frac{1}{\sqrt{3}}|+\rangle + i\frac{\sqrt{2}}{\sqrt{3}}|-\rangle$$

$$|\psi_2\rangle = \frac{1}{\sqrt{5}}|+\rangle - \frac{2}{\sqrt{5}}|-\rangle$$

$$|\psi_3\rangle = \frac{1}{\sqrt{2}}|+\rangle + i\frac{e^{\frac{i\pi}{4}}}{\sqrt{2}}|-\rangle$$

(a) For each of the $|\psi_i\rangle$ above, find the normalized vector $|\phi_i\rangle$ that is orthogonal to it.

(b) Calculate the inner products $\langle\psi_i|\psi_j\rangle$ for i and $j = 1, 2, 3$.