Math 1553 Worksheet §6.1 - §6.5

1. True/False. Justify your answer.
(1) If u is in subspace W, and u is also in $W^\perp$, then $u = 0$.

(2) If y is in a subspace W, the orthogonal projection of y onto $W^\perp$ is 0.

(3) If x is orthogonal to v and w, then x is also orthogonal to $v - w$.

2. **a)** Find the standard matrix B for proj_W, where $W = \text{Span}\left\{\begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}\right\}$.

b) What are the eigenvalues of B? Is B is diagonalizable?

c) Let $x = \begin{pmatrix} 3 \\ 0 \\ 9 \end{pmatrix}$. Find the orthogonal decomposition of x with respect to W.

In other words, find x_W in W and $x_{W^\perp}$ in $W^\perp$ so that $x = x_W + x_{W^\perp}$.

3. Use least-squares to find the best fit line $y = Ax + B$ through the points $(0,0)$, $(1,8)$, $(3,8)$, and $(4,20)$.