

**Math 1553 Worksheet §6.1 - §6.5**

**1.** True/False. Justify your answer.

(1) If  $u$  is a vector that is orthogonal to itself, 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  $\text{proj}_W$ , where  $W = \text{Span} \left\{ \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix} \right\}$ .

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

c) Let  $x = \begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix}$ . Find the projection  $x_W$  of  $x$  onto the subspace  $W$  and the orthogonal projection  $x_{W^\perp}$  of  $x$  onto the subspace  $W^\perp$ .

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