

## Quiz 10 (12am)

For the problems below let

$$v_1 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \quad v_2 = \begin{bmatrix} -2 \\ 1 \\ 2 \end{bmatrix}, \quad w = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}.$$

1. Are  $v_1$  and  $v_2$  orthogonal? Show your work. (2 pts.)
2. Find  $v_2 \cdot (v_1 - v_2)$ . (6 pts.)
3. Find  $\text{proj}_w(v_1)$  the projection of  $v_1$  onto  $w$ . (6 pts.)
4. Express  $v_1$  as  $v_1 = u_1 + u_2$  where  $u_1$  is in the direction of  $w$  and  $u_2$  is orthogonal to  $w$ , that is they satisfy  $u_1 \in \text{span}(w)$  and  $u_2 \in \text{span}(w)^\perp$ . (6 pts.)