

(If you need the space, clearly mark work to be graded on the scrap page.)

2) (25 pt) Let $\mathcal{W} = \text{span} \left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ -1 \\ 0 \end{bmatrix} \right\}$ be a subspace of \mathbb{R}^4 .

a) (10 pt) Find a basis for the orthogonal complement \mathcal{W}^\perp of \mathcal{W} .

b) (10 pt) Construct an orthogonal basis for \mathbb{R}^4 that contains the vectors $\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ -1 \\ 0 \end{bmatrix}$. Hint:

You may use your result from part (a) or any other method.

c) (5 pt) Find a basis for the subspace of \mathcal{W} consisting of all vectors in \mathcal{W} orthogonal to $\begin{bmatrix} 0 \\ 2 \\ -1 \\ 2 \end{bmatrix}$.