(a) $\mathbf{w}_1 \cdot \mathbf{w}_2 = 0$ so they form an orthogonal set. The vectors $\mathbf{n}_1 = \mathbf{w}_1/||\mathbf{w}_1|| = [1/3,\ 1/3,\ 1/3], \mathbf{n}_2 = \mathbf{w}_2/||\mathbf{w}_2|| = [1/2,\ 0,\ -1/2]$, are an orthonormal basis, so the projection is $\mathbf{w} = (\mathbf{v} \cdot \mathbf{n}_1)\, \mathbf{n}_1 + (\mathbf{v} \cdot \mathbf{n}_2)\, \mathbf{n}_2 = [2,\ 2,\ 2] = [3/2,\ 2,\ 5/2]$,

(b) The Gram-Schmidt process gives:

$$\mathbf{v}_1 = \mathbf{u}_1 = [1,\ 1,\ 0,\ 0\,]$$

$$\mathbf{v}_2 = \mathbf{u}_2 - (\mathbf{u}_2 \cdot \mathbf{v_1})/(\mathbf{v}_1 \cdot \mathbf{v_1})\mathbf{v}_1 = [-1/2,\ 1/2,\ 1,\ 0\,]$$

$$\mathbf{v}_3 = \mathbf{u}_3 - (\mathbf{u}_3 \cdot \mathbf{v_1})/(\mathbf{v}_1 \cdot \mathbf{v_1})\mathbf{v}_1 - (\mathbf{u}_3 \cdot \mathbf{v_2})/(\mathbf{v}_2 \cdot \mathbf{v_2})\mathbf{v}_2 = [-1/3,\ 1/3,\ -1/3,\ 1\,]$$

Note that $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$ are orthogonal.