M351 AHw§7.7 (S. Zhang) .

1.

$$\mathbf{a} = \langle 1, 1, -1 \rangle,\ \mathbf{b} = \langle 1, 2, -2 \rangle,$$

(a) Find a unit vector $\mathbf{c}$ parallel to $\mathbf{a}$.

(b) Find a vector 4 times long of $\mathbf{a}$, but in the opposite direction.

(c) Find $\mathbf{a} - 3\mathbf{b}$

(d) Find $\mathbf{a} \cdot \mathbf{b}$

(e) Find $proj_b \mathbf{a}$

(f) Write $\mathbf{a} = \mathbf{a}_1 + \mathbf{a}_2$ where $\mathbf{a}_1 \parallel \mathbf{b}$ and $\mathbf{a}_2 \perp \mathbf{b}$, show $\mathbf{a}_2 \cdot \mathbf{b} = 0$.

(g) Show $\mathbf{a}$ and $\mathbf{b}$ are linearly independent.

2.

$$\mathbf{u}_1 = \langle 1, 1, 1 \rangle,\ \mathbf{u}_2 = \langle 0, 1, 1 \rangle,\ \mathbf{u}_3 = \langle 1, 1, 0 \rangle,$$

(a) Show linearly independence

(b) Find a linear combination for $\mathbf{a} = \langle 0, 1, 0 \rangle$, i.e, coordinates of $\mathbf{a}$ under the basis.

(c) Find the orthgonal bases by Gram-Schmidt orthogonalization process

(d) Find the orthnormal bases by Gram-Schmidt orthogonalization process.

(e) Find a linear combination for $\mathbf{a} = \langle 0, 1, 0 \rangle$, i.e, coordinates of $\mathbf{a}$ under the orthnormal basis.