

Group Members Names: \_\_\_\_\_

Fall 2025 Math 310 Schwitzerlett Worksheet # 4 October 30, 2025

*Work each problem thoroughly, show all necessary work. Each group should turn in 1 paper.*

1. Suppose  $\mathbf{S}$  is a subspace of  $\mathbb{R}^3$ ,

(a) If  $\mathbf{S}$  contains only the zero vector what is  $\mathbf{S}^\perp$ ?

(b) If  $\mathbf{S}$  is spanned by  $(1, 1, 1)$ , what is  $\mathbf{S}^\perp$ ?

(c) If  $\mathbf{S}$  is spanned by  $(1, 1, 1)$  and  $(1, 1, -1)$ , what is a basis for  $\mathbf{S}^\perp$ ?

2. Find the projection of vector  $\vec{b}$  onto the line through  $\mathbf{a}$ . Show that  $\vec{e}$  is orthogonal to  $\mathbf{a}$ .

$$\vec{b} = \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix} \quad \mathbf{a} = \begin{bmatrix} -1 \\ -3 \\ -1 \end{bmatrix}$$

3. Let  $\vec{b} = \begin{bmatrix} 0 \\ 2 \\ 4 \end{bmatrix}$  and  $A = \begin{bmatrix} 0 & 1 \\ 1 & 2 \\ 2 & 0 \end{bmatrix}$ . Find  $\vec{p}$  and  $P$  when projecting  $\vec{b}$  onto the column space of  $A$ .

4. Consider the following points.

$$(0,0), (1, 8), (3, 8), (4, 20)$$

Find the line of best fit  $b = D + Ct$  and vectors  $\vec{p}$  and  $\vec{e}$ .