Name (Last, First): _____

Student ID: _____

1. Find the set of all $\mathbf{x}$ in $\mathbb{R}^2$ minimizing $\|A\mathbf{x} - \mathbf{b}\|$ where

$$A = \begin{bmatrix} 2 & 1 \\ 4 & -1 \\ 2 & 1 \end{bmatrix}, \qquad \mathbf{b} = \begin{bmatrix} 3 \\ -1 \\ 5 \end{bmatrix}.$$

2. Let H be the subspace of $\mathbb{R}^4$ given by

$$H = \text{span}\left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \\ -3 \\ 1 \end{bmatrix} \right\}.$$

Find an orthonormal basis for H.