Name: ID #: Section #:

(**1**) Let

$$A = \begin{pmatrix} 3 & 4 & 7 & 9 \\ -1 & 2 & -3 & 4 \\ 1 & 2 & 7 & 9 \\ 0 & 0 & 1 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} -1 \\ 5 \\ -6 \\ 2 \end{pmatrix}, \quad X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}.$$

(**a**) [*3.5pts*] Find $\text{rank}(A|B)$

(**b**) [*1.5pts*] Is the system $AX = B$ consistent? Justify your answer!

(**2**) [*5pts*] Let

$$A = \begin{pmatrix} 0 & -2 & 2 \\ -2 & 0 & -2 \\ 2 & -2 & 0 \end{pmatrix}.$$

Find an orthogonal matrix P that diagonalizes A and find the diagonal matrix D such that $D = P^T AP$.