不可使用手機、計算器，禁止作弊!
背面還有題目

1. Find a matrix C such that $D = C^{-1}AC$ is an orthogonal diagonalization of the given matrix A.

$$A = \begin{bmatrix} 4 & 2 & 2 \\ 2 & 4 & 2 \\ 2 & 2 & 4 \end{bmatrix}$$

Answer: C =_____ and D =_____

$$C = \begin{bmatrix} \frac{-1}{\sqrt{2}} & \frac{-1}{\sqrt{6}} & \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{6}} & \frac{1}{\sqrt{3}} \\ 0 & \frac{2}{\sqrt{6}} & \frac{1}{\sqrt{3}} \end{bmatrix}, D = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 8 \end{bmatrix}$$

2. Find the projection matrix for the subspace $W = sp(\vec{a}_1, \vec{a}_2)$ of $\mathbb{R}^3$ and use it to find the projection vector $\vec{b}$ on W, if

$$\vec{a}_1 = \begin{bmatrix} 6/5 \\ 8/5 \\ 0 \end{bmatrix}, \vec{a}_2 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \vec{b} = \begin{bmatrix} 5 \\ -10 \\ 5 \end{bmatrix},$$

Answer: the projection vector $\vec{b}$ on $W=$_____ and the projection matrix =_____

the projection vector $\vec{b}$ on $W = \begin{bmatrix} -3 \\ -4 \\ 5 \end{bmatrix}$ and the projection matrix $= \begin{bmatrix} 9/25 & 12/25 & 0 \\ 12/25 & 16/25 & 0 \\ 0 & 0 & 1 \end{bmatrix}$