**1. Determine   a single-layer perceptron neural network to classify
the two-class patterns:**
 A: {0,0), (0.5,0), (0,0.5)}
 B: {1, 0.5), (0.5,1), (1,1)}

 where

$$y = \Psi(w_1 x_1 - w_2 x_2 + \theta), \qquad \Psi(x) = \begin{cases} 1 & x > 0 \\ 0 & x \le 0 \end{cases}$$

2. Showing that a multilayer perceptron neural network with linear activation function is equivalent to a single-layer perceptron network.

3. Show that two class of patterns below are not linearly separable.

$$\text{class I}: \quad X_1 = \begin{bmatrix} -1 \\ -1 \\ 1 \\ 1 \end{bmatrix}, \quad X_2 = \begin{bmatrix} 1 \\ 1 \\ -1 \\ -1 \end{bmatrix} \quad d_1 = 1$$

$$\text{class II}: \quad Y_1 = \begin{bmatrix} -1 \\ 1 \\ -1 \\ 1 \end{bmatrix}, \quad Y_2 = \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \end{bmatrix} \quad d_2 = -1$$

3. Consider two class of patterns below

$$\text{class I:} \quad X_1 = \begin{bmatrix} -1 \\ -1 \\ 1 \\ 1 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ 1 \\ -1 \\ -1 \end{bmatrix} \quad d_1 = -1$$

$$\text{class II:} \quad X_1 = \begin{bmatrix} -1 \\ 1 \\ -1 \\ 1 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \end{bmatrix} \quad d_2 = 1$$

Designing a RBF neural network to separate them by using a Gaussian activation function.