

Name:

Student ID#:

Statistical Pattern Recognition (CE-725)
Department of Computer Engineering
Quiz #5 solution - Spring 2010

a. (6 points) Consider a 2-D pairwise linearly separable problem with the following discriminate functions:

$$g_{12}(x) = -x_1 - x_2 + 5$$

$$g_{13}(x) = -x_1 + 3$$

$$g_{23}(x) = -x_1 + x_2$$

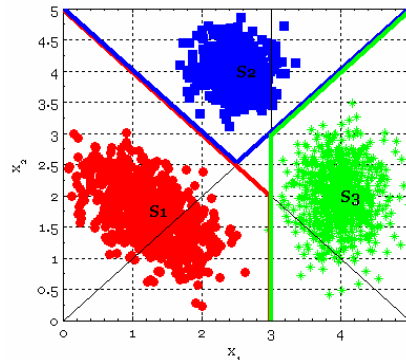
Draw the decision boundaries and label classified regions and any indeterminate regions.

$$x \in S_1 : \begin{cases} -x_1 - x_2 + 5 > 0 \\ -x_1 + 3 > 0 \end{cases}$$

$$x \in S_2 : \begin{cases} x_1 + x_2 - 5 > 0 \\ -x_1 + x_2 > 0 \end{cases}$$

$$x \in S_3 : \begin{cases} x_1 - 3 > 0 \\ x_1 - x_2 > 0 \end{cases}$$

Indeterminate region: central triangular region



b. (4 points) For a two class discrimination problem where each class is a Gaussian, the resulting decision boundary can sometimes be expressed as a linear discriminant function. What conditions must be satisfied for this to be the case?

From the course materials and DHS book (chap 2 sec 6):

$$\Sigma_1 = \Sigma_2 = \Sigma \quad \text{and} \quad \mu_1 \neq \mu_2$$