CECS 8820 Pattern Recognition **Problem Set 2** **Fall, 2008**

For the following problems, assume 2-variate Normal densities and a 0-1 loss function with $\mu_1 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ and $\mu_2 = \begin{pmatrix} 0 \\ 5 \end{pmatrix}$ and $P(\omega_1) = P(\omega_2)$.

For each problem:

(a) Compute the equation of the decision boundary from Bayes Decision Theory
(b) Sketch the graph and label the decision regions
(c) Classify the feature vector $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ computationally.

1. $\Sigma_1 = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$ and $\Sigma_2 = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$

2. $\Sigma_1 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ and $\Sigma_2 = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$

3. $\Sigma_1 = \begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ and $\Sigma_2 = \begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$

4. $\Sigma_1 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ and $\Sigma_2 = \begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$

5. Redo problem 1 for $P(\omega_1) = ¼$.

6. Redo problem 4 for $P(\omega_2) = ¼$.

7. Repeat problem 3(c); classify the feature vector $\begin{pmatrix} 0 \\ 18 \end{pmatrix}$