$n=2$
$k=2$

$$g_1(x) = \frac{1}{\sqrt{2\pi}\,|\Sigma_1|} e^{-1/2\, X^t \Sigma_1^{-1} X} \quad ; \Sigma_1 = \begin{bmatrix} \sigma_{11}^2 & 0 \\ 0 & \sigma_{12}^2 \end{bmatrix}$$

$$g_2(x) = \frac{1}{\sqrt{2\pi}\,|\Sigma_2|} e^{-1/2\, X^t \Sigma_2^{-1} X} \quad ; \Sigma_2 = \begin{bmatrix} \sigma_{21}^2 & 0 \\ 0 & \sigma_{22}^2 \end{bmatrix}$$

$$g_1(x) = g_2(x)$$

$$\frac{1}{|\Sigma_1|} e^{-1/2\, X^t \Sigma_1^{-1} X} = \frac{1}{|\Sigma_2|} e^{-1/2\, X^t \Sigma_2^{-1} X}$$

$$\frac{1}{(\sigma_{11}\sigma_{12})^2} e^{-1/2\left(\frac{x_1^2}{\sigma_{11}^2} + \frac{x_2^2}{\sigma_{12}^2}\right)} = \frac{1}{(\sigma_{21}\sigma_{22})^2} e^{-1/2\left(\frac{x_1^2}{\sigma_{21}^2} + \frac{x_2^2}{\sigma_{22}^2}\right)}$$

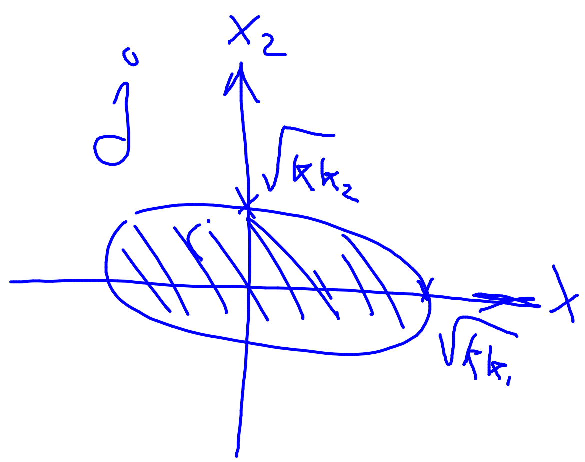
$$-2\ln(\sigma_{11}\sigma_{12}) - \frac{1}{2}\left(\frac{x_1^2}{\sigma_{11}^2} + \frac{x_2^2}{\sigma_{12}^2}\right) = -2\ln(\sigma_{21}\sigma_{22}) - \frac{1}{2}\left(\frac{x_1^2}{\sigma_{21}^2} + \frac{x_2^2}{\sigma_{22}^2}\right)$$

$$k = X_1^2 \underbrace{\left(\frac{-1}{2\sigma_{11}^2} + \frac{1}{2\sigma_{21}^2}\right)}_{1/k_1} + X_2^2 \underbrace{\left(\frac{-1}{2\sigma_{11}^2} + \frac{1}{2\sigma_{22}^2}\right)}_{1/k_2}$$

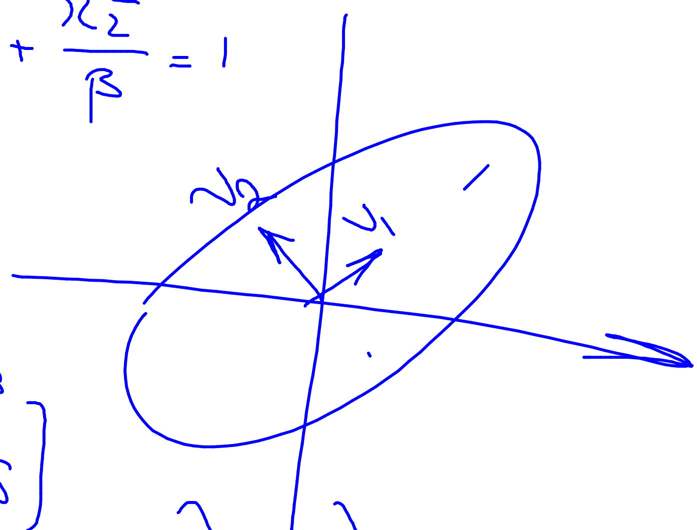
$$\frac{x_1^2}{k_1} + \frac{x_2^2}{k_2} = k$$

$$\frac{x_1^2}{kk_1} + \frac{x_2^2}{kk_2} = 1$$

assump: $kk_2 > 0$
$kk_1 > 0$



$x_1 x_2$ $\dfrac{x_1^2}{\alpha} + \dfrac{x_2^2}{\beta} = 1$



$$\begin{bmatrix} \alpha & \beta \\ \gamma & \delta \end{bmatrix}$$

2 مقدار ویژه λ λ_1 λ_2

2 بردار $\vec{v}$ $\vec{v}_1 \perp$ $\vec{v}_2$

$g_1 = -x_1 + x_2$ ✓

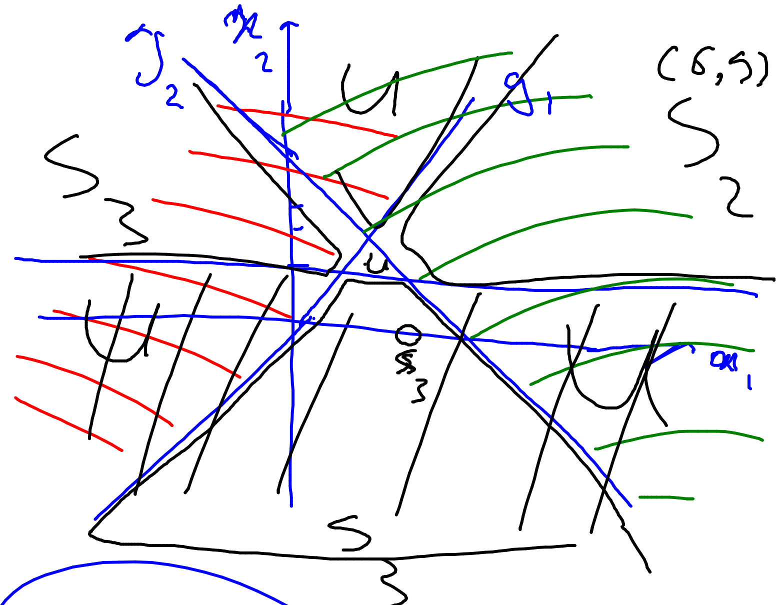
$g_2 = x_1 + x_2 - 5$ ✓

$g_3 = -x_2 + 1$ ✓

$g_1 = 0 \longrightarrow x_2 = x_1$

$g_2 \longrightarrow x_2 = 5 - x_1$

$g_3 \quad x_2 = 1$



HW1-1

HW # 1, 2

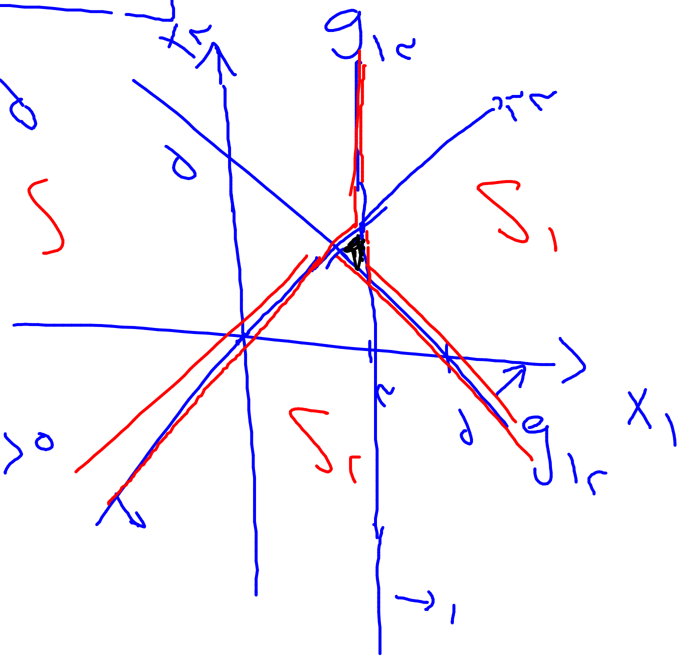
$g_{12}: x_2 = -x_1 + 3$

$g_{13}: x_1 = 2$

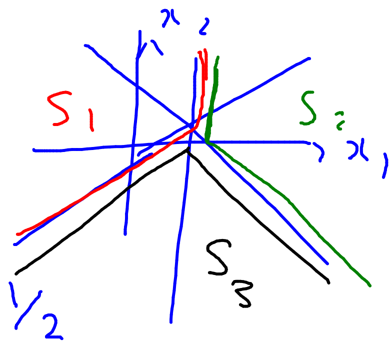
$g_{23}: x_1 = x_2$

$\underline{x} \to S_k \quad g_{kj}(\underline{x}) > 0$

$\forall j \neq k$



(HMW #1, 3)



S_1:

$$\begin{cases} -x_1 + x_2 > x_1 + x_2 - 1 \\ -x_1 + x_2 > -x_2 \end{cases} \Rightarrow \begin{cases} x_1 < 1/2 \\ x_2 > x_1/2 \end{cases}$$

S_2: $\begin{cases} x_1 > 1/2 \\ x_2 > -\frac{x_1}{2} + \frac{1}{2} \end{cases}$

S_3: $\begin{cases} x_2 < x_1/2 \\ x_2 < -x_1/2 + 1/2 \end{cases}$

$\boxed{HW \# 1,4}$

$(*)\ g_k(x) > g_j(x) \quad \forall k \neq j$

$(**)\ g_{ij}$

$g_k(x) - g_j(x) > 0 \quad \forall k \neq j$

$(*)\ \mathrm{Max}\{g_k(x)\}$

$\underbrace{}\ g_{kj}(x) > 0 \quad \forall k \neq j$

$(**)\ S_k : g_{kj} > 0 \quad \forall j \neq k$

g

$$g_i(x) = \omega_i^t X + \omega_{i0}$$

$$\lambda X_1 + (1-\lambda) X_2 \in R_i$$

Assign X to S_i iff $g_i(x) > g_k$ for all $j \neq k$

$$X_1 \in R_i \Rightarrow W_i^t X_1 + W_0 > g_K$$

$$X_2 \in R_i \Rightarrow W_i^t X_2 + W_0 > g_K$$

$$\begin{cases} \lambda W_i^t X_1 + \lambda W_0 > \lambda g_K \\ (1-\lambda) W_i X_1 + (1-\lambda) W_0 > (1-\lambda) g_K \end{cases}$$

$$\Rightarrow W_i^t [\lambda X_1 + (1-\lambda) X_2] + W_0 > g_K \Rightarrow$$

$$\Rightarrow \lambda X_1 + (1-\lambda) X_2 \in R_i$$