In The Name of God, The Compassionate, The Merciful

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Statistical Pattern Recognition (CE-725)
Department of Computer Engineering
Quiz #2 solution (Mathematical Review)
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1. (10 points) Consider two Gaussians $N_1(\mu_1, \Sigma_1)$ and $N_2(\mu_2, \Sigma_2)$ with the following parameters:

$$\mu_1 = \begin{bmatrix} o \\ o \end{bmatrix},\ \mu_2 = \begin{bmatrix} c \\ o \end{bmatrix}, \qquad \Sigma_1 = \begin{bmatrix} p & o \\ o & q \end{bmatrix},\ \Sigma_2 = \begin{bmatrix} q & o \\ o & p \end{bmatrix}$$

Each point in the 2-d Cartesian space belongs to one of these Gaussians (A point x belongs to N_1, if $P_1(x)>P_2(x)$ and vice versa, where P_1 and P_2 are probability distribution functions of N_1 and N_2). Itmeans that these two Gaussians partition the whole space to two subspaces. Write down the boundary equation in the following form:

$$A\begin{bmatrix} x_1^2 \\ x_2^2 \end{bmatrix} + B\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + C = o$$