Solve for X^T

$$X^T \mathcal{E}^{-1}(\mu_\kappa - \mu_\lambda) - \frac{1}{2}(\mu_\kappa + \mu_\lambda)^T \mathcal{E}^{-1}(\mu_\kappa - \mu_\lambda) + \log\left(\frac{\pi_\kappa}{\pi_\ell}\right) = \emptyset$$

$\pi = .5$

$\pi_\kappa = \pi_\ell$

$\log(1) = 0$

$$X^T \mathcal{E}^{-1}(\mu_\kappa - \mu_\lambda) - \frac{1}{2}(\mu_\kappa + \mu_\lambda)^T \mathcal{E}^{-1}(\mu_\kappa - \mu_\lambda) = \emptyset$$

$$\mathcal{E}^{-1} = ? \quad \mathcal{E}^{-1} = \begin{pmatrix} 1.0 & 0 \\ 0 & .5625 \end{pmatrix}^{-1} \cdot \begin{pmatrix} \frac{1}{1} & 0 \\ 0 & \frac{1}{.5625} \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1.778 \end{pmatrix}$$

$$\mu_\kappa - \mu_\lambda = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad \begin{pmatrix} 2 \\ -2 \end{pmatrix} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$$

$\mu_\lambda \qquad \mu_\mu$

$2 \times 2 \quad 2 \times 1 \qquad (2 \times 1)^T \quad 2 \times 2$

$$X^T \begin{pmatrix} 1 & 0 \\ 0 & 1.778 \end{pmatrix} \begin{pmatrix} 2 \\ -2 \end{pmatrix} - \frac{1}{2}\begin{pmatrix} 2 \\ -2 \end{pmatrix}^T \begin{pmatrix} 1 & 0 \\ 0 & 1.778 \end{pmatrix} \begin{pmatrix} 2 \\ -2 \end{pmatrix} = \emptyset$$

$$X^T \begin{pmatrix} 2 \\ -3.556 \end{pmatrix} - \frac{1}{2}\begin{pmatrix} 2 & -3.556 \end{pmatrix}\begin{pmatrix} 2 \\ -2 \end{pmatrix} = \emptyset$$

$1 \times 2 \quad 2 \times 1$

$$X^T \begin{pmatrix} 2 \\ -3.556 \end{pmatrix} - \frac{1}{2}(11.112) = \emptyset$$

$$X^T \begin{pmatrix} 2 \\ -3.556 \end{pmatrix} - 5.556 = \emptyset$$

$$\boxed{2x_1 - 3.556x_2 - 5.556}$$

(2