

Q.5.

1. the posterior can be calculated as below.

$$P(p|D) = N(p|m_n, \lambda_n^{-1})$$

$$m_n = \lambda_x n_x \bar{x} + \lambda_y n_y \bar{y}$$

$$\lambda_n = \lambda_0 + n_x \lambda_x + n_y \lambda_y$$

here $\bar{x} = \frac{1}{n_x} \sum_{k=1}^N x_k$ and $\bar{y} = \frac{1}{n_y} \sum_{k=1}^N y_k$ are the

sample average. We put the expression for the mean and the variance/precision in terms of known variables $x, y, n_x, n_y, \lambda_x, \lambda_y$. In addition, the prior is non-informative question so $\lambda_0 = 0$

$$m_n = \frac{\lambda_x n_x \bar{x} + \lambda_y n_y \bar{y}}{n_x \lambda_x + n_y \lambda_y}$$

$$= \frac{\frac{1}{\lambda_x} n_x \bar{x} + \frac{1}{\lambda_y} n_y \bar{y}}{\frac{n_x}{\lambda_x} + \frac{n_y}{\lambda_y}}$$

$$\frac{n_x}{\lambda_x} + \frac{n_y}{\lambda_y}$$