Homework 2
MA5755
No Due Date

Do the following exercises without turning them in. There is no credit for this assignment, but doing these problems will help you prepare for the mid sem and end sem exams.

Exercise 3.2 from Murphy's book.

Exercise 3.3 from Murphy's book.

Exercise 3.4 from Murphy's book.

Exercise 3.5 from Murphy's book. This can be done as was shown in the lecture. You should also verify that the covariance matrix for the multivariable is Σ.

Exercise. Recall that the cumulative probability function for $X \sim \mathcal{N}(0,1)$ is

$$P(x) = \frac{1}{2} + \frac{1}{2}\text{erf}\left(\frac{x}{\sqrt{2}}\right)$$

- Verify by evaluating the error function that when $a = 1.96$ the probablility that $x \in [-a, a]$ is 95 percent.
- Find the 95 percent confidence interval centered at μ when $X \sim \mathcal{N}(\mu, \sigma)$.

Exercise. For a matrix $A \in \mathbb{R}^{D\times D}$ vector $b \in R^D$ and scalar $c \in \mathbb{R}$ the quadratic form $f : R^D \to \mathbb{R}$ is defined by $f(x) = x^T Ax + b^T x + c$.

- Show that the gradient is $\nabla f(x) = (A + A^T)x + b$
- Using this result, verify that the MLE for the mean of the multivariable Gaussian is given by formula (4.43).