Tutorial 3

1. Consider a logistic regression model

$$\log \frac{p(y=1|x)}{p(y=0|x)} = 1.0 + 2.0 * x$$

The probability that $y = 1$ when $x = 5$ is (   )

a. 0.88   b. 0.21   c. 1.0   d. 0.37

2. If the probability density function $p(\boldsymbol{x}|c) \sim \mathcal{N}(\boldsymbol{\mu}_c, \Sigma_c)$, proof:

the MLE of $\boldsymbol{\mu}_c$ and Σ_c is

$$\widehat{\boldsymbol{\mu}}_c = \frac{1}{|D_c|} \sum_{\boldsymbol{x}_i \in D_c} \boldsymbol{x}_i$$

$$\Sigma_c = \frac{1}{|D_c|} \sum_{\boldsymbol{x}_i \in D_c} (\boldsymbol{x}_i - \widehat{\boldsymbol{\mu}}_c)(\boldsymbol{x}_i - \widehat{\boldsymbol{\mu}}_c)^T$$

where $p(\boldsymbol{x}) = \frac{1}{(2\pi)^{-\frac{p}{2}}|\Sigma|^{\frac{1}{2}}} \cdot e^{-\frac{1}{2}(x-\boldsymbol{\mu})^T \Sigma^{-1} (x-\boldsymbol{\mu})}$