Correction Tutorial 3

1. (a) See the R code. We want to avoid too many loops, so we create

$$\begin{pmatrix} u_1 & u_1 & \dots & u_1 \\ \vdots & \vdots & & \vdots \\ u_p & u_p & \dots & u_p \end{pmatrix} - \begin{pmatrix} X_1 & X_2 & \dots & X_n \\ \vdots & \vdots & & \vdots \\ X_1 & X_2 & \dots & X_n \end{pmatrix}$$

   to get all the possible $u_j - X_i$.

   (b)

$$\begin{aligned} \mathbb{E}\big[C(g)\big] &= -2\int g(x)f(x)dx + \int g(x)^2 dx \\ &= \underbrace{\int \big(f(x)-g(x)\big)^2 dx}_{\substack{\text{non negative and null} \\ \text{if and only if } f=g}} - \int f(x)^2 dx \end{aligned}$$

   (c) See the R code.

   (d) See the R code.

   (e) See the R code. Notice that the $V = 5$ fold is more stable than the Hold-out.

2. (a) See the R code.

   (b) See the course :

$$\hat{\theta}_{obs} = \frac{1}{\bar{X}}$$

See the R code for the remaining questions.