# ST 705 Linear models and variance components
# Homework problem set 7

February 18, 2020

1. (2 points) Exercise 3.20 from Monahan.

2. (2 points) Exercise 3.24 from Monahan.

3. (2 points) Exercise 3.26 from Monahan.

4. (2 points) Let $X$ be an $n \times p$ matrix with $\text{rank}(X) = r$, and let $C$ be a $(p-r) \times p$ matrix with

   (i) $\text{rank}(C) = p - r$ and

   (ii) $\text{column}(X') \cap \text{column}(C') = \{0\}$.

   Show that $C(X'X + C'C)^{-1}C' = I_{p-r}$.

5. (2 points) Maximize the function $f(x) := \sum_{i=1}^{k} n_i \log(x_i)$ subject to the constraints

$$\sum_{i=1}^{k} x_i = 1,$$
$$x_i \geq 0,$$

   with $\{n_i\}$ a set of fixed scalars.

6. (2 points) Exercise 4.1 from Monahan.

7. (2 points) Exercise 4.2 from Monahan.