ST 705 Linear models and variance components
Lab practice problem set 4

February 2, 2022

1. Let A, B, C, and D be real valued matrices of dimension $p \times p$, $p \times q$, $q \times p$, and $q \times q$, respectively. Show that if D is invertible, then

$$\det \begin{pmatrix} A & B \\ C & D \end{pmatrix} = \det(D) \cdot \det(A - BD^{-1}C).$$

2. If P is a symmetric and idempotent matrix, show that the Pythagorean relationship holds:

$$\|y\|^2 = \|Py\|^2 + \|(I - P)y\|^2.$$