1. $(a+b)'(a+b) = a'a + a'b + b'a + b'b = a'a + 2a'b + b'b$

   $b'a = $ scalar

2. $aa' = \begin{pmatrix} a_1 a_1 & a_1 a_2 & \cdots & a_1 a_p \\ a_2 a_1 & a_2 a_2 & \cdots & a_2 a_p \\ \cdots & \cdots & \ddots & \cdots \\ a_p a_1 & a_p a_2 & \cdots & a_p a_p \end{pmatrix}$

   $tr(aa') = \sum_{i=1}^{p} (aa')_{ii} = \sum_{i=1}^{p} a_i^2 = a'a$

3. $tr(cA) = \sum_{i=1}^{p} (cA)_{ii} = \sum_{i=1}^{p} c a_{ii} = c \sum_{i=1}^{p} a_{ii} = c \, tr(A)$

4. $cAB = I$ $(p \times p)$ identity matrix

   $cAB = I$

   $AB = \frac{1}{c} I$

   $A^{-1}AB = \frac{1}{c} A^{-1} I$

   $B = \frac{1}{c} A^{-1}$

5. $\quad B(p) \cdot A = I$

$\quad B(p) \cdot A = \frac{1}{g}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \frac{1}{g}\begin{pmatrix} da-bc & db-bd \\ -ca+ac & -cb+ad \end{pmatrix} =$

$\quad \frac{1}{g}\begin{pmatrix} ad-bc & 0 \\ 0 & ad-bc \end{pmatrix}$

$\quad g = ad-bc \qquad ad \neq bc$

6. $\quad l'l = \sum_{i=1}^{p} l_i l_i = \sum_{i=1}^{r} 1 = p$

$\quad (l\,l')^2 = l\,l'\,l\,l' = l(l'l)\,l' = p\,l\,l'$