1. For two-sample T^2-test it is known that $T_{ob}^2 = \left(\frac{1}{\Lambda} - 1\right)(n - 2)$.

   (1) Let r be the Roy's greatest root. Derive a formula for computing T_{ob}^2 based on r.

   (2) Let Pt be the Pillai's trace. Derive a formula for computing T_{ob}^2 based on Pt.

2. File T6-10.dat contains four variables x1, x2, x3 and type= $\begin{cases} \text{diesel} \\ \text{gasoline} \end{cases}$ that are forms two samples

   from $X_d \sim N(\mu_d, \Sigma)$ and $X_g \sim N(\mu_g, \Sigma)$. Here $\mu_d = \begin{pmatrix} \mu_{d1} \\ \mu_{d2} \\ \mu_{d3} \end{pmatrix}$ and $\mu_g = \begin{pmatrix} \mu_{g1} \\ \mu_{g2} \\ \mu_{g3} \end{pmatrix}$.

   (1) Report your test on $H_0 : \mu_d - \mu_g = \begin{pmatrix} -2 \\ 1 \\ 1 \end{pmatrix}$.

   (2) Report your test on $H_0 : (\mu_{d1} + \mu_{d2}) - (\mu_{g1} + \mu_{g2}) = 0$ and $(\mu_{d2} + \mu_{d3}) - (\mu_{g2} + \mu_{g3}) = 10$.