

Problem set is due in class on Nov. 11th. You must show your work to receive credit.

1. Expand the matrix product

$$\mathbf{X} = \{[\mathbf{AB} + (\mathbf{CD})'][(\mathbf{EF})^{-1} + \mathbf{GH}]\}'.$$

Assume that all matrices are square and that  $\mathbf{E}$  and  $\mathbf{F}$  are nonsingular.

2. Calculate  $|\mathbf{A}|$ ,  $\text{tr}(\mathbf{A})$ , and  $\mathbf{A}^{-1}$  for

$$\mathbf{A} = \begin{bmatrix} 1 & 4 & 7 \\ 3 & 2 & 5 \\ 5 & 2 & 8 \end{bmatrix}$$

3. What operation is performed by postmultiplying a matrix by a diagonal matrix? What about premultiplication?
4. Are the following quadratic forms positive for all values of  $\mathbf{x}$ ?
  - (a)  $y = x_1^2 - 28x_1x_2 + (11x_2)^2$
  - (b)  $y = 5x_1^2 + x_2^2 + 7x_3^2 + 4x_1x_2 + 6x_1x_3 + 8x_2x_3$
5. Using your data, produce some descriptive statistics and univariate and bivariate graphs.
6. Using your data, estimate a sensible regression (using R) with two independent variables.
  - (a) Check the regression for influential observations and reestimate if necessary.
  - (b) Substantively interpret all estimated coefficients, standard errors, and the residual standard error.
  - (c) Demonstrate how every number (25 of them) in the regression summary is calculated.