

# Problem Set 3

September 1, 2009

1. Consider the matrices:

$$\begin{bmatrix} \alpha & \phi & \theta & \beta \\ \delta & \mu & \beta & \alpha \end{bmatrix}$$
$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

and

$$[1 \ 0 \ 1]$$

where K is the first matrix, L is the second matrix, and M is the third matrix (or vector). Arrange these three matrices so they are conformable for matrix multiplication.

2. The matrixes X and Y are (respectively):

$$\begin{bmatrix} 4 & 6 \\ 1 & 2 \end{bmatrix}$$

and

$$\begin{bmatrix} -3 & 5 & 0 & 1 \\ 7 & 2 & -4 & 3 \end{bmatrix}$$

- (a) Determine the tranpose of each matrix, X' and Y'.  
(b) Show that  $(XY)' = Y'X'$ .

3. Determine which of the following matrices are nonsingular:

- (a) G

$$\begin{bmatrix} 12 & -3 \\ 1 & 4 \end{bmatrix}$$

- (b) H

$$\begin{bmatrix} \frac{1}{2} & 2 \\ \frac{1}{6} & \frac{2}{3} \end{bmatrix}$$

(c) J

$$\begin{bmatrix} 2 & 5 \\ 4 & 9 \end{bmatrix}$$

(d) K

$$\begin{bmatrix} 4 & -4 \\ 1 & 1 \end{bmatrix}$$

4. Determine the inverse of the matrix A,

$$\begin{bmatrix} 6 & -2 \\ 3 & 5 \end{bmatrix}$$

by first finding its determinant and then its adjoint. Show that  $A^{-1}A = I$ .

5. Consider the simplified, two equation, national income model:

$$Y = C + I + G \tag{1}$$

$$C = a + bY \tag{2}$$

where national income (Y) and consumption (C) are endogenous variable and investment (I) and government spending (G) are exogenous variables. The parameters in the consumption function, a and b, represent the autonomous consumption expenditure and the marginal propensity to consume, respectively.

(a) Set up this model in matrix form.

(b) Find the solution to this system of equations.