

## ECO 318, Practice Problems: Linear Algebra

Consider the following matrices:

$$A = \begin{bmatrix} 3 & 9 \\ 1 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 4 & 1 \\ 1 & 4 \\ 5 & 3 \end{bmatrix} \quad C = \begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 3 \end{bmatrix}$$

1. Calculate the following:

a.  $CB$

b.  $BC$

c.  $A + (CB)$

d.  $A + (BC)$

e.  $A^{-1}$

f.  $\text{Det}(A)$

g.  $C^{-1}$

h. the eigenvalues and eigenvectors of  $CB$

i. the eigenvalues and eigenvectors of  $C$

j.  $B^{-1}$

2. Consider the following model:

$$y_t + \alpha\pi_t = e_t \tag{1}$$

$$\pi_t = u_t \quad (2)$$

where  $y_t$  is output and  $\pi_t$  is inflation, both endogenous variables, and  $e_t$  and  $u_t$  are exogenous shocks so that:

$$Dx_t = \mu_t \quad (3)$$

- a. Write (1) and (2) as a single matrix equation with endogenous variables on the left hand side and shocks on the right hand side.
- b. Solve for (using matrix algebra) the endogenous variables as a function of the shocks.
- c. Take the eigendecomposition of  $D$ .