

Place your name on the back of this sheet of paper and nowhere else. Staple your answers face up on the front of this sheet of paper. Failure to follow these directions will cost you 1 point. If you use double-sided printing or print on the back of scrap paper, I will give you one additional point.

Show all work.

1) (20 points) Suppose there are three industries, steel, bread, and computers. \$1 of steel requires \$0.20 worth of steel, \$0.10 worth of bread, and \$0.30 worth of computers. \$1 of bread requires \$0.25 worth of steel, \$0.35 worth of bread, and \$0.04 worth of computers. \$1 of computers requires \$0.15 worth of steel, \$0.33 worth of bread, and \$0.20 worth of computers. Write the input-output matrix. BRIEFLY state what you did. Multiply that matrix by the column vector of the three goods. What does each entry in the new vector represent? Explain your logic.

2) (5 points) Either the rows or the columns of an input-output matrix cannot total to more than 1. Which is it? Why?

3) Suppose $A = \begin{bmatrix} 1 & 6 & -1 \\ 2 & 5 & -2 \\ 3 & 4 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 0 & 4 \\ -2 & 1 & 3 \\ -1 & 1 & -4 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 1 & 0 & -1 \\ -1 & 2 & 3 & 0 \\ -2 & -1 & 1 & 1 \end{bmatrix}$, $D = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$

A) (10 points) Calculate $A+B$

B) (10 points) Calculate BD .

C) (10 points) Calculate $D^T C$.

D) (5 points) Which of the following calculations cannot be done? Explain your logic. A-C or AC?

E) (15 points) Find the trace(AB) and trace of (BA). Are they the same as the theorem says they should be? (Note you do not need to calculate every entry in AB and BA .)

4) (10 points) The book says the profits of a firm are symbolized by $\Pi = \mathbf{p}^T \mathbf{q} - \mathbf{w}^T \mathbf{z}$. What do each of the letters represent? Why do the \mathbf{p} and \mathbf{q} have a T superscript?

5) (15 points) Suppose the selling prices of goods produced by a company are $p_1 = 2$, $p_2 = 3$, and $p_3 = 1$. The costs of their inputs are $w_1 = 4$, $w_2 = 2$, and $w_3 = 3$. Write the vector of prices and

the vector of costs. Find the profits if the \mathbf{q} and \mathbf{z} vectors were $\begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix}$ and $\begin{bmatrix} z_1 \\ z_2 \\ z_3 \end{bmatrix}$.