Homework 4B

Name___________________________________

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

1) Find the inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. 1) ____________

2) The matrix $\begin{bmatrix} 3 & x \\ 4 & 36 \end{bmatrix}$ has no inverse if x = ? 2) ____________

3) Two n × n matrices A and B are called inverses of each other if both products AB and BA equal I_n. Are the following matrices inverses of each other? 3) ____________

$A = \begin{bmatrix} 7 & 4 \\ 5 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -4 \\ -5 & 7 \end{bmatrix}$

4) Given that $\begin{bmatrix} 2 & -2 & -1 \\ -5 & 3 & 4 \\ -6 & 5 & 4 \end{bmatrix}$ and $\begin{bmatrix} 8 & -3 & 5 \\ 4 & -2 & 3 \\ 7 & -2 & 4 \end{bmatrix}$ are inverses of each other, 4) ____________

find A so that $(A - I)^{-1} = \begin{bmatrix} 8 & -3 & 5 \\ 4 & -2 & 3 \\ 7 & -2 & 4 \end{bmatrix}$.

Find the inverse, if it exists, for the matrix.

5) $\begin{bmatrix} -6 & -2 \\ 4 & 6 \end{bmatrix}$ 5) ____________

6) Given that the matrices $A = \begin{bmatrix} 1 & 2 & 2 \\ 1 & 3 & 2 \\ 1 & 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -2 & -2 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ are inverses of each other, find 6) ____________

the solution $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ of the system $\begin{cases} -5x - 2y - 2z = 1 \\ -x + y = 2 \\ -x + z = -3 \end{cases}$.

7) Consider the system $\begin{cases} 2x + 3y = 4 \\ -2x - y = 8 \end{cases}$ 7) ____________

(a) Rewrite it in the form AX = B, where A, B, and X are appropriate matrices.

(b) Find the inverse of A.

(c) Solve the system by computing $A^{-1}B$.

8) Use the Gauss–Jordan method to compute $\begin{bmatrix} -1 & 2 & -4 \\ 1 & -1 & 3 \\ 0 & 0 & 1 \end{bmatrix}^{-1}$. 8) ____________

9) Use the Gauss–Jordan method to compute the inverse of the matrix, if it exists. 9) ____________

$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

Solve the problem.

10) The economy of a small country can be regarded as consisting of three industries, I, II, and III, whose input–output matrix is 10) ______________

$$A = \begin{array}{c} \\ \text{I} \\ \text{II} \\ \text{III} \end{array} \begin{array}{c} \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 0.20 & 0.01 & 0.30 \\ 0.30 & 0.10 & 0.02 \\ 0.05 & 0.40 & 0.10 \end{bmatrix} \end{array}$$

Suppose x, y, and z represent the output of industries I, II, and III, respectively. An algebraic expression for the amount of output from industry III that can be exported is

11) An economy consisting of agriculture (I) and manufacturing (II) has the following input–output matrix. 11) ______________

$$A = \begin{array}{c} \\ \text{I} \\ \text{II} \end{array} \begin{array}{c} \begin{array}{cc} \text{I} & \text{II} \end{array} \\ \begin{bmatrix} 0.1 & 0.3 \\ 0.3 & 0.4 \end{bmatrix} \end{array}$$

How many units of agriculture and manufacturing should be produced in order to meet a demand for 15 units from I and 9 units from II?

12) Suppose the following matrix represents the input–output matrix of a simplified economy that involves just three commodity categories: manufacturing, agriculture, and transportation. How many units of each commodity should be produced to satisfy a demand of 1300 units for each commodity? 12) ______________

$$\begin{array}{c} \\ \text{Mfg} \\ \text{Agri} \\ \text{Trans} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Mfg} & \text{Agri} & \text{Trans} \end{array} \\ \begin{bmatrix} 0 & 1/4 & 1/3 \\ 1/2 & 0 & 1/4 \\ 1/4 & 1/4 & 0 \end{bmatrix} \end{array}$$