Name:

Quiz #12. Econ 340. Section 001. Schaum's Chapter 10 and Chapter 11 unit 1.

1. For matrices A and B and for vectors **v** and **w** carry out the indicated matrix operations:

$$A = \begin{matrix} 1 & 2 & 3 \\ 1 & 4 & 6 \\ -1 & -1 & 2 \end{matrix} \qquad B = \begin{matrix} 1 & 0 & 0 \\ 2 & 2 & 0 \\ 3 & 0 & 3 \end{matrix}$$

v = (1, 1, 1) **w** = (1, 2, 3)

a) A – B

b) A***w**^{T}

c) A * B

d) $\mathbf{v} * \mathbf{w}^T$

2. Which of the following examples of matrix multiplication can actually be carried out (are "conformable.")

DO NOT CARRY OUT THE MULTIPLICATION, JUST EXPLAIN IF IT IS POSSIBLE.

a)
$$\begin{matrix} 1 & 2 \\ 2 & 3 \\ 3 & 5 \end{matrix} * \begin{matrix} 1 & 0 \\ 0 & 1 \\ 2 & 2 \end{matrix}$$

b)
$$\begin{matrix} 1 & 1 \\ 2 & 3 \\ 3 & 5 \end{matrix} * \begin{matrix} 1 & 0 & 2 \\ 0 & 1 & 2 \end{matrix}$$

Answers:

1. For matrices A and B and for vectors **v** and **w** carry out the indicated matrix operations:

$$A = \begin{matrix} 1 & 2 & 3 \\ 1 & 4 & 6 \\ -1 & -1 & 2 \end{matrix} \qquad B = \begin{matrix} 1 & 0 & 0 \\ 2 & 2 & 0 \\ 3 & 0 & 3 \end{matrix}$$

$\mathbf{v} = (1, 1, 1)$ $\mathbf{w} = (1, 2, 3)$

a) A – B

$$\begin{matrix} 1-1 & 2-0 & 3-0 \\ 1-2 & 4-2 & 6-0 \\ -1-3 & -1-0 & 2-3 \end{matrix} = \begin{matrix} 0 & 2 & 3 \\ -1 & 2 & 6 \\ -4 & -1 & -1 \end{matrix}$$

b) $A*\mathbf{w}^T$

$$\begin{matrix} 1 & 2 & 3 \\ 1 & 4 & 6 \\ -1 & -1 & 2 \end{matrix} \begin{matrix} 1 \\ 2 \\ 3 \end{matrix} = \begin{matrix} 1*1 + 2*2 + 3*3 \\ 1*1 + 2*4 + 3*6 \\ 1*-1 + 2*-1 + 3*2 \end{matrix} = \begin{matrix} 14 \\ 27 \\ 3 \end{matrix}$$

c) A * B

The observant will note that the first column of B is the vector $\mathbf{w}^T$ and therefore we have already done the values for the first column of the answer:

$$\begin{matrix} a_{11} = 14 & a_{12} & a_{13} \\ a_{21} = 27 & a_{22} & a_{23} \\ a_{31} = 3 & a_{32} & a_{33} \end{matrix}$$

To find the second column of our answer, find the product of the matrix A times the second column of matrix B:

$a_{12} = (1,2,3)\cdot(0,2,0) = 1*0 + 2*2 + 3*0 = 4$

$a_{22} = (1,4,6)\cdot(0,2,0) = 1*0 + 4*2 + 6*0 = 8$

$a_{32} = (-1, -1, 2)\cdot(0,2,0) = -1*0 + (-1*2) + 2*0 = -2$

To find the third column of our answer, find the product of the matrix A times the third column of the matrix B:

$a_{13} = (1,2,3)*(0,0,3) = 9$

$a_{23} = (1,4,6)*(0,0,3) = 18$

$a_{33} = (-1, -1, 2)*(0,0,3) = 6$

Final Solution:

$$\begin{matrix} 14 & 4 & 9 \\ 27 & 8 & 18 \\ 3 & -2 & 6 \end{matrix}$$

d) $\mathbf{v} * \mathbf{w}^T = (1,1,1)\cdot(1,2,3) = 1 + 2 + 3 = 6$

2. Which of the following examples of matrix multiplication can actually be carried out (are "conformable.")

DO NOT CARRY OUT THE MULTIPLICATION, JUST EXPLAIN IF IT IS POSSIBLE.

a)
$$\begin{matrix} 1 & 2 \\ 2 & 3 \\ 3 & 5 \end{matrix} * \begin{matrix} 1 & 0 \\ 0 & 1 \\ 2 & 2 \end{matrix}$$

This is the attempted multiplication of a 3x2 matrix and a 3*2 matrix; the "inner" dimensions do not match, so we cannot carry out the multiplication – NOT CONFORMABLE.

b)
$$\begin{matrix} 1 & 1 \\ 2 & 3 \\ 3 & 5 \end{matrix} * \begin{matrix} 1 & 0 & 2 \\ 0 & 1 & 2 \end{matrix}$$

This is the attempted multiplication of a 3x2 matrix and a 2x3 matrix; the "inner" dimensions do match, so we CAN carry out the multiplication – CONFORMABLE.