

INF 1004 Mathematics 2
Tutorial #7

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Question 1

Let

$$A = \begin{pmatrix} 2 & 1 \\ 1 & 7 \end{pmatrix} \quad B = \begin{pmatrix} -2 & 5 \\ 0 & 8 \end{pmatrix} \quad C = \begin{pmatrix} 6 & 0 & 3 \\ 1 & 0 & -5 \end{pmatrix} \quad D = \begin{pmatrix} 4 & 0 & -4 \\ -3 & 4 & 9 \end{pmatrix}$$

Compute, if possible

- | | | |
|-----------------|---------------|---------------------|
| (a) $A + B$ | (d) $A + C$ | (g) $5D - 3C$ |
| (b) $B + A$ | (e) $(C^T)^T$ | (h) $5D^T - 3C^T$ |
| (c) $A + B + C$ | (f) $C + C^T$ | (i) $(B^T - A^T)^T$ |

Solution:

- | | | |
|---|--|---|
| (a) $\begin{pmatrix} 0 & 6 \\ 1 & 15 \end{pmatrix}$ | (d) not possible | (h) $\begin{pmatrix} 2 & -18 \\ 0 & 20 \\ -29 & 60 \end{pmatrix}$ |
| (b) $\begin{pmatrix} 0 & 6 \\ 1 & 15 \end{pmatrix}$ | (e) C | |
| | (f) not possible | |
| (c) not possible | (g) $\begin{pmatrix} 2 & 0 & -29 \\ -18 & 20 & 60 \end{pmatrix}$ | (i) $\begin{pmatrix} -4 & 4 \\ -1 & 1 \end{pmatrix}$ |

My Solution

Question 2

Determine the constants a, b, c and d , such that the following equation holds.

$$\begin{pmatrix} 0 & a & 3 \\ b & 2 & 2 \end{pmatrix} + \begin{pmatrix} c & 1 & 2 \\ 1 & 1 & d \end{pmatrix} = \begin{pmatrix} 4 & 3 & 5 \\ 7 & 3 & 5 \end{pmatrix}.$$

Solution: $a = 2, b = 6, c = 4, d = 3$

My Solution

Question 3

Given the matrices A and B, compute the products AB and BA .

$$A = \begin{pmatrix} 1 & 2 \\ 0 & -1 \\ 4 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 2 & 1 \\ -1 & 1 & 0 \end{pmatrix}$$

Solution:

$$AB = \begin{pmatrix} -1 & 4 & 1 \\ 1 & -1 & 0 \\ 3 & 9 & 4 \end{pmatrix}, \quad BA = \begin{pmatrix} 5 & 1 \\ -1 & -3 \end{pmatrix}$$

My Solution

Question 4

If A and B are invertible $n \times n$ matrices, use the definition of the inverse, to prove that

$$(AB)^{-1} = B^{-1}A^{-1}.$$

My Solution

Question 5

Solve for the matrix A,

$$\left[5A^T + \begin{pmatrix} 1 & 0 \\ 2 & 5 \end{pmatrix} \right]^T = 3A + \begin{pmatrix} 1 & -2 \\ -1 & 3 \end{pmatrix}^T.$$

Solution:

$$A = \frac{1}{2} \begin{pmatrix} 2 & 0 \\ 1 & 4 \end{pmatrix}$$

My Solution

Question 6

In 2010, the average salary for all accountants in San Diego and Salt Lake City, was \$45, 091.50. The average salary in San Diego alone, however, was \$5231 greater than the average salary in Salt Lake City alone. What is the average salary of an accountant in each city, assuming that there are the same number of accountants in each city?

Solution: The average salary in San Diego and Salt Lake City is \$47,707 and \$42,476, respectively.

My Solution

Question 7

A chemist has prepared two acid solutions, one of which is 2% by volume, the other 7%. How many cubic centimeters of each should the chemist mix together, to obtain 40cm^3 of a 3.2% acid solution?

Solution: For the 2% solution is 30.4cm^3 and for the 7% solution is 9.6cm^3 .

My Solution