

Recitation 5

Practiced on: 2/7 & 2/9

5:30 - 6:20 pm

Matrices

Note: These problems are designed for practice during a 50 minute recitation.

- a) **Easy** problems: expected to be solved in 5 min.
- b) **Medium** problems: expected to be solved in 30 min.
- c) **Hard** problems: expected to be solved in 15 min.

During the recitation, you may discuss the problems with your peers and the TA. Please control your volume and don't annoy others. An electronic copy of these problems and solutions will be posted on the following URL: <http://cs.utsa.edu/~btang/pages/teaching.html>.

Questions:

1. (Easy, 2 min) Let $A = \begin{bmatrix} 1 & 1 & 1 & 3 \\ 2 & 0 & 4 & 6 \\ 1 & 1 & 3 & 7 \end{bmatrix}$. (Textbook [KR] Page 254: 1d & e)

- a) What is the element of A in the (3, 2)th position?
- b) What is A^t ?

2. (Easy, 3 min) Find $A + B$, where (Textbook [KR] Page 254: 2a)

$$A = \begin{bmatrix} 1 & 0 & 4 \\ -1 & 2 & 2 \\ 0 & -2 & -3 \end{bmatrix}, B = \begin{bmatrix} -1 & 3 & 5 \\ 2 & 2 & -3 \\ 2 & -3 & 0 \end{bmatrix}$$

3. (Medium, 5 min) If $A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 4 \\ 1 & 3 \end{bmatrix}$, find AB . (Textbook [KR] Page 255: 3a)

4. (Medium, 10 min) Show that if A is a 2×2 matrix such that $AB = BA$ whenever B is a 2×2 matrix, then $A = cI$, where c is a real number and I is the 2×2 identity matrix.

A_n $n \times n$ matrix is called **upper triangular** if $a_{ij} = 0$ whenever $i > j$. (Textbook [KR] Page 260: 43)

5. (Medium, 15 min) What is the most efficient way to multiply the matrices A_1, A_2, A_3 , and A_4 if the dimensions of these matrices are $10 \times 2, 2 \times 5, 5 \times 20$, and 20×3 , respectively? (Textbook [KR] Page 256: 25)

6. (Hard, 15 min) Let A be the 2×2 matrix: $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$. Show that if $ad - bc \neq 0$, then: $A^{-1} =$

$$\begin{bmatrix} \frac{d}{ad-bc} & \frac{-b}{ad-bc} \\ \frac{-c}{ad-bc} & \frac{a}{ad-bc} \end{bmatrix}. \text{ (Textbook [KR] Page 256: 19)}$$

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