Lecture 4 - Practice Questions

1. Consider the matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. What is $a_{1,2}$?
   - A. 1
   - B. 2
   - C. 3
   - D. 4

2. Consider a matrix A and its transpose A^t. Which of the following matrix products are defined?
   - A. AA^t but not A^tA
   - B. A^tA but not AA^t
   - C. Neither AA^t nor A^tA
   - D. Both A^tA and AA^t

3. Consider two matrices A and B and assume that both products AB and BA are defined. Which of the following statements is false?
   - A. The number of rows of A is the same as the number of columns of B
   - B. The number of columns of A is the same as the number of rows of B
   - C. A and B must be squared
   - D. None of the others

4. What is the result of the following multiplication (by a scalar) $2 \cdot \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
   - A. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
   - B. $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$
   - C. $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$
   - D. $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$

5. Let $A = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$. What is the entry $(1,1)$ of A^2?
   - A. 0
   - B. 1
   - C. 2
   - D. 4

6. Let $A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \\ 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 3 & 0 & 1 \\ 0 & 4 & 2 & 3 \end{pmatrix}$. What is the dimension of AB?

A. 3×4

B. 3×2

C. 2×4

D. 3×3

7. A matrix has dimension 3×5. What is the dimension of its transpose?

A. 3×3

B. 3×5

C. 5×3

D. 5×5

8. Consider the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 2 & 1 \end{pmatrix}$. What's the entry in position $(1, 3)$ of the transpose of A?

A. 0

B. 1

C. 2

D. None of the others

9. For which values of a is the matrix $\begin{pmatrix} a & -2 & -3 \\ 2a & 3 & a^2 - 2 \\ 1 & a & -1 \end{pmatrix}$ symmetric?

A. $a = -1$

B. $a = 2$

C. $a = 2$ or $a = -1$

D. None of the others

10. For which value k is the matrix $\begin{pmatrix} 1 & 4 & 3 \\ 2 & 3 & 2 \\ 6 & 2 & 2 \\ 2 & k & 1 \end{pmatrix}$ symmetric?

A. $k = 0$

B. $k = 1$

C. Any $k \in \mathbb{R}$

D. None of the others

11. Which of the following matrices is not upper triangular?

A. $\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$

B. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$

D. $\begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$

12. Which of the following matrices can be summed to $\begin{pmatrix} 2 & 3 & 5 \\ 0 & 3 & 1 \end{pmatrix}$?

A. $\begin{pmatrix} 1 & 3 \\ 4 & 2 \end{pmatrix}$

B. $\begin{pmatrix} 1 & 4 \\ 2 & 3 \\ 1 & 0 \end{pmatrix}$

C. $\begin{pmatrix} 3 & 1 & 3 \\ 2 & 4 & 1 \end{pmatrix}$

D. $\begin{pmatrix} 1 & 4 & 3 \\ 1 & 5 & 2 \\ 3 & 1 & 2 \end{pmatrix}$

13. What is the result of $\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix} + \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$?

A. $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$

B. $\begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}$

D. $\begin{pmatrix} 1 & 3 \\ 2 & 2 \end{pmatrix}$

14. Consider the matrices $A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ 0 & 2 \end{pmatrix}$. What is the entry in position $(2, 1)$ of BA ?

A. 0

B. 1

C. 2

D. None of the others

15. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ and I the 2×2 identity matrix. What is the entry in position $(1, 2)$ of AI?

A. 1

B. 2

C. 3

D. None of the others

16. What's the entry in position $(1, 1)$ of the matrix product $\begin{pmatrix} 2 & 3 & 2 \\ 4 & 2 & 1 \end{pmatrix} \cdot \begin{pmatrix} 0 & -1 & 3 & -2 \\ 2 & 1 & 1 & 0 \\ 2 & 1 & 9 & 3 \end{pmatrix}$?

A. 4

B. 6

C. 8

D. 10

Question	Correct Answer
1	B
2	D
3	C
4	D
5	C
6	A
7	C
8	D
9	D
10	D
11	A
12	C
13	C
14	C
15	B
16	D