

# Collaborative Filtering Quiz

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For writing matrix of the form, follow the convention, a,b,c,d,e,f

$$\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix},$$

Your answer



1.1 Consider a problem, How many solutions are there for  $m=n$ ?

1 point

$$b_{m \times 1} = A_{m \times n} x_{n \times 1}.$$

- ☐ One
- ☐ None
- ☐ Infinitely Many
- ☐ None of the above

1.2 How many solutions are there for  $m > n$ ? 1 point

- ☐ One
- ☐ None
- ☐ Infinitely Many
- ☐ None of the above

What are the requirements of a matrix to have an inverse?

- ☐ Matrix must be square
- ☐ Matrix must be full rank
- ☐ All of the above
- ☐ None of the above



3. What is the determinant of

$$\begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$$

- ☐ 5
- ☐ 7
- ☐ -1
- ☐ 1

4. What is the rank of the matrix

$$\begin{bmatrix} 2 & 4 & 2 \\ 1 & 2 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

- ☐ 3
- ☐ 2
- ☐ 1
- ☐ 0

5. Which of the following statements are correct about matrix multiplications? P1: It is associative P2: It is commutative P3: It is distributive over addition

- ☐ P1 & P2
- ☐ P2 & P3
- ☐ P3 & P1
- ☐ All of the above



6. Find the product of the two matrices

$$\begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 4 \end{bmatrix} \text{ and } \begin{bmatrix} 3 \\ 1 \\ 4 \end{bmatrix}.$$

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7. Consider the matrix . How many vectors are there in its null space?

$$\begin{bmatrix} 2 & 3 \\ 3 & 3 \\ 4 & 7 \end{bmatrix}$$

- ☐ 0
- ☐ 1
- ☐ Infinitely many
- ☐ 2

8. Compute the eigen decomposition of

$$\begin{bmatrix} 4 & 6 \\ 2 & 2 \\ 3 & 1 \end{bmatrix}.$$

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9. Consider the matrix . 9.1 Find its eigenvalues

$$\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}.$$

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9.2 Find the corresponding eigenvectors.

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10. Consider a set of orthogonal vectors in picture below. Which of the following statements are true? P1: S is linearly independent P2: S is orthonormal P3: S is a basis for  $\mathbb{R}^n$

$$\mathbb{R}^n, S = \{v_1, v_2, \dots, v_{n-1}, v_n\}$$

- ☐ P1 & P2
- ☐ P2 & P3
- ☐ P3 & P1
- ☐ all of the above.

11. Which of the following methods are used for solving linear system of equations? P1: Gaussian Elimination P2: Gauss Jordan P3: Gauss Seidel

- ☐ P1
- ☐ P2
- ☐ P3
- ☐ All of the above



12. Which statement(s) is(are) true about derivatives of determinants?

P1:  $\partial(\det(X)) = \text{Trace}(\text{adj}(X)\partial X)$

P2:  $\partial(\det(X)) = \det(X)\text{Trace}(X^{-1}\partial X)$

- ☐ P1
- ☐ P2
- ☐ Both
- ☐ None

13. Which statement(s) is(are) true about first order derivatives of Traces?

P1:  $\frac{\partial}{\partial X} \text{Trace}(X^T A) = A$

P2:  $\frac{\partial}{\partial X} \text{Trace}(AX^T) = A$

- ☐ P1
- ☐ P2
- ☐ Both
- ☐ None



14. Which statement(s) is(are) true about second order derivatives of Traces?

$$\text{P1: } \frac{\partial}{\partial X} \text{Trace}(X^T B X) = B X + B^T X$$

$$\text{P2: } \frac{\partial}{\partial X} \text{Trace}(B X X^T) = B X + B^T X$$

$$\text{P3: } \frac{\partial}{\partial X} \text{Trace}(X X^T B) = B X + B^T X$$

- ☐ P1
- ☐ P2
- ☐ P3
- ☐ All of the above

15. Which statement(s) is(are) true?

$$\text{P1: } \partial \|X\|_F^2 = 2X$$

$$\text{P2: } \partial (\text{Trace}(X X^T)) = 2X$$

- ☐ P1
- ☐ P2
- ☐ Both
- ☐ None



16. Find the Cholesky decomposition of

$$\begin{bmatrix} 1 & 2 \\ 3 & 3 \end{bmatrix}.$$

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17. Find the LU decomposition of

$$\begin{bmatrix} 3 & 1 \\ -6 & -4 \end{bmatrix}.$$

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18. Find the QR decomposition of

$$\begin{bmatrix} 1 & 0 \\ 0 & -2 \end{bmatrix}.$$

[Add file](#)

19. Find the Cholesky decomposition of

$$\begin{bmatrix} 1 & 1 \\ 1 & 5 \end{bmatrix}.$$

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20. Which of the following statement(s) are true P1: All pivots in row-echelon form must be positive. P2: All eigenvalues must be positive. P3: All the values in the matrix must be positive.

- ☐ P1 & P2
- ☐ P2 & P3
- ☐ P3 & P1
- ☐ All of the above

21. Find the singular values of the matrix

$$\begin{bmatrix} 1 & 2 \\ 2 & 2 \\ 2 & 1 \end{bmatrix}$$

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22. Does singular value decomposition exist for all matrices?

Your answer

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