CHAPTER 11.1

Matrices and Systems of Linear Equations

Multiple-Choice Old Exam Questions

16 questions • 3 topics • options A–E • two questions per page

Topic 1 | Solving a Linear System

Solving a system, or the system of an augmented matrix, and finding a combination of the unknowns • Questions 1–6

Q **1**

If $\left[\begin{array}{ccc|c} 3 & 3 & 4 & -3 \\ 4 & 4 & 2 & 1 \end{array}\right]$ is the augmented matrix of a linear system, then the solution set of the system is

A) $\left\{\left(1-c,\ c,\ -\frac{3}{2}\right)\right\}$, where c is any real number.

B) $\left\{\left(4,\ 3,\ -\frac{3}{2}\right)\right\}$

C) $\emptyset$

D) $\{(4-2c,\ 4-2c,\ c)\}$, where c is any real number.

E) $(-\infty, \infty)$

Q **2**

If $(a,\ b,\ c)$ is the solution of the system $\begin{cases} x-3y+z=8 \\ 2x-5y-3z=2 \\ x+4y+z=1 \end{cases}$, then $a+b+c=$

A) -4

B) -6

C) 6

D) -1

E) 4

Q
3

If (a, b, c) is the solution of the system $\begin{cases} x - y + 3z = 10 \\ 2x - y + 7z = 24 \\ 3x - 6y + 7z = 21 \end{cases}$, then $a + b + c =$

A) 8

B) 13

C) 6

D) 10

E) 12

Q
4

If (a, b, c) is the solution of the linear system $\begin{cases} x - 3y + z = 8 \\ 2x - 5y - 3z = 2 \\ x + 4y + z = 1 \end{cases}$, then $5a =$

A) 12

B) -5

C) 8

D) 5

E) 13

Q
5

If (u, v, w) is the solution of the linear system $\begin{cases} x - z = -3 \\ y + z = 9 \\ x + z = 7 \end{cases}$, then

$uvw =$

A) 40

B) 20

C) 11

D) 21

E) 13

Q
6

If (a, b, c) is the solution of the linear system whose augmented matrix is $\left[\begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 0 & 1 & 2 & 5 \\ -1 & 2 & 1 & 3 \end{array}\right]$, then $a + b + c =$

A) 4

B) -5

C) 0

D) -3

E) 6

Topic 2 | Echelon Form and Row Reduction

Writing an augmented matrix in echelon form and finding the missing entries • Questions 7–8

Q 7

If the augmented matrix $\left[\begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 3 & 4 & -1 & 13 \\ 2 & 2 & 0 & 6 \end{array}\right]$ is written in the echelon form as $\left[\begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 0 & 1 & k & m \\ 0 & 0 & 1 & n \end{array}\right]$, then $k + m + n =$

A) 4

B) 8

C) 6

D) 16

E) 10

Q 8

If the echelon form of the augmented matrix $\left[\begin{array}{ccc|c} 1 & 1 & 1 & 2 \\ 3 & 2 & 4 & 5 \\ 2 & 1 & 1 & 6 \end{array}\right]$ is $\left[\begin{array}{ccc|c} 1 & a & b & 2 \\ 0 & 1 & c & 1 \\ 0 & 0 & 1 & -\frac{3}{2} \end{array}\right]$, then $abc =$

A) -1

B) 1

C) $\frac{1}{2}$

D) $-\frac{1}{2}$

E) 2

Topic 3 | Consistent, Inconsistent and Dependent Systems

Deciding whether a system has no solution, one solution or infinitely many solutions, and finding the constants that cause each case
• Questions 9–16

Q 9

If the augmented matrix of a system of linear equations is $\left[\begin{array}{ccc|c} 1 & 2 & 3 & 7 \\ 0 & -x^2 & -4 & -3 \\ 0 & 0 & 4x^2-1 & x-\frac{1}{2} \end{array}\right]$, then the system is inconsistent if $x =$

A) $-\frac{1}{2}$

B) $\frac{1}{2}$

C) 2

D) $\frac{1}{4}$

E) $-\frac{1}{4}$

Q 10

The value of k for which the system of equations $\begin{cases} x+kz=1 \\ y+z=2 \\ 2x+y=5 \end{cases}$ is inconsistent equals

A) $-\frac{1}{2}$

B) -1

C) $\frac{3}{2}$

D) $-\frac{3}{2}$

E) $-\frac{5}{2}$

Q
11

If $\left[\begin{array}{ccc|c} 1 & -3 & 1 & 5 \\ 3 & -7 & 2 & 12 \\ 2 & -6 & k & 10 \end{array}\right]$ is the augmented matrix of a dependent system of linear equations, then $k =$

A) 2

B) 4

C) 7

D) 1

E) 3

Q
12

If the augmented matrix of a system of equations is $\left[\begin{array}{ccc|c} 1 & 2 & 3 & 4 \\ 0 & 1 & C^2 & 1 \\ 0 & 2 & 8 & C \end{array}\right]$, which one of the following is FALSE?

A) The system is inconsistent for all $C \neq -2$.

B) The system is inconsistent for $C = -2$.

C) The system has a unique solution for all $C \neq \pm 2$.

D) The system has infinitely many solutions for $C = 2$.

E) The system can be made consistent or inconsistent for a suitable value of C.

Q
13

The linear system whose augmented matrix is $\left[\begin{array}{ccc|c} 1 & -3 & 4 & 1 \\ 2 & -5 & 3 & 6 \\ 1 & -2 & -1 & 5 \end{array}\right]$ has

A) infinitely many solutions

B) no solution

C) one solution $(1, 2, 1)$

D) one solution $(1, -2, -1)$

E) one solution $(1, 6, 5)$

Q
14

The system of linear equations $\begin{cases} x + 2y = 1 \\ x + 3y + z = 4 \\ 2y + 2z = 6 \end{cases}$ has

A) three solutions only

B) no solution

C) a unique solution

D) infinitely many solutions

E) two solutions only

Q
15

The system of linear equations $\begin{cases} x - 3y + z = 5 \\ -7y + 2z = 12 - 3x \\ 2x - 6y + 2z = 10 \end{cases}$

A) is dependent

B) has three solutions only

C) is independent

D) is inconsistent

E) has two solutions only

Q
16

Let $\left[\begin{array}{ccc|c} 1 & 2 & 3 & -1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & k-1 & m-2 \end{array}\right]$ be the augmented matrix of a linear system of equations. Then the system is

A) inconsistent if $k = 1$ and $m \neq 2$

B) dependent with an infinite number of solutions if $k \neq 1$ and $m = 2$

C) inconsistent if $k \neq 1$ and $m = 2$

D) independent with only one solution if $k = 1$ and $m = 2$

E) dependent with an infinite number of solutions if $k \neq 1$ and $m \neq 2$

Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	5	**A**	$\left\{\left(1-c,\ c,\ -\frac{3}{2}\right)\right\}$, where c is any real number.
2	9	**E**	4
3	10	**C**	6
4	11	**A**	12
5	12	**A**	40
6	15	**A**	4
7	6	**A**	4
8	7	**A**	-1
9	1	**A**	$-\frac{1}{2}$
10	2	**A**	$-\frac{1}{2}$
11	3	**A**	2
12	4	**A**	The system is inconsistent for all $C \neq -2$.
13	8	**A**	infinitely many solutions
14	13	**D**	infinitely many solutions
15	14	**A**	is dependent
16	16	**A**	inconsistent if $k = 1$ and $m \neq 2$