Readiness Assurance Test

Choose the most appropriate response for each question.

1) Which of the following is a solution to the system of linear equations

$$\begin{aligned} x + 3y - z &= 2 \\ 2x + 8y + 3z &= -1 \\ -x - y + 9z &= -10 \end{aligned}$$

(a) $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$

2) Find a basis for the solution set of the following homogeneous system of linear equations

$$\begin{aligned} x + 2y + -z - w &= 0 \\ -2x - 4y + 3z + 5w &= 0 \end{aligned}$$

(a) $\left\{ \begin{bmatrix} 1 \\ 2 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 3 \end{bmatrix} \right\}$ (b) $\left\{ \begin{bmatrix} 2 \\ -1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \\ 3 \\ -1 \end{bmatrix} \right\}$ (c) $\left\{ \begin{bmatrix} 2 \\ -1 \\ 3 \\ -1 \end{bmatrix} \right\}$ (d) $\left\{ \begin{bmatrix} 1 \\ 2 \\ 1 \\ 5 \end{bmatrix} \right\}$

3) Determine which property applies to the set of vectors

$$\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \right\} \subset \mathbb{R}^3.$$

(a) It does not span and is linearly dependent
(b) It does not span and is linearly independent
(c) It spans but it is linearly dependent
(d) It is a basis of $\mathbb{R}^3$.

4) Determine which property applies to the set of vectors

$$\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 3 \end{bmatrix} \right\} \subset \mathbb{R}^3.$$

(a) It does not span and is linearly dependent
(b) It does not span and is linearly independent
(c) It spans but it is linearly dependent
(d) It is a basis of $\mathbb{R}^3$.

5) Determine which property applies to the set of vectors

$$\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -2 \\ 0 \\ -2 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 3 \\ -3 \end{bmatrix} \right\} \subset \mathbb{R}^3.$$

(a) It does not span and is linearly dependent
(b) It does not span and is linearly independent
(c) It spans but it is linearly dependent
(d) It is a basis of $\mathbb{R}^3$.

6) Determine which property applies to the set of vectors

$$\left\{ \begin{bmatrix} 2 \\ 2 \\ -1 \end{bmatrix}, \begin{bmatrix} -3 \\ 1 \\ -2 \end{bmatrix}, \begin{bmatrix} 1 \\ 5 \\ -4 \end{bmatrix} \right\} \subset \mathbb{R}^3.$$

(a) It spans but it is linearly dependent
(b) It is a basis of $\mathbb{R}^3$.
(c) It does not span and is linearly independent
(d) It does not span and is linearly dependent

7) Suppose $\mathbf{v}_1, \ldots, \mathbf{v}_n \in \mathbb{R}^5$ and you know that every vector in span $\{\mathbf{v}_1, \ldots, \mathbf{v}_n\}$ can be written uniquely as a linear combination of the vectors $\{\mathbf{v}_1, \ldots, \mathbf{v}_n\}$. What can you conclude about n?

(a) $n \geq 5$
(b) $n \leq 5$
(c) $n = 5$
(d) n could be any positive integer

8) Suppose you know that every vector in $\mathbb{R}^5$ can be written as a linear combination of the vectors $\{\mathbf{v}_1, \ldots, \mathbf{v}_n\}$. What can you conclude about n?

(a) $n = 5$
(b) n could be any positive integer
(c) $n \leq 5$
(d) $n \geq 5$

9) Suppose you know that every vector in $\mathbb{R}^5$ can be written uniquely as a linear combination of the vectors $\{\mathbf{v}_1, \ldots, \mathbf{v}_n\}$. What can you conclude about n?

(a) n could be any positive integer
(b) $n \leq 5$
(c) $n \geq 5$
(d) $n = 5$

10) Suppose you know that every vector in $\mathbb{R}^5$ can be written uniquely as a linear combination of the vectors $\{\mathbf{v}_1, \ldots, \mathbf{v}_n\}$. What can you conclude about the set $\{\mathbf{v}_1, \ldots, \mathbf{v}_n\}$?

(a) It does not span and is linearly dependent
(b) It does not span and is linearly independent
(c) It is a basis of $\mathbb{R}^5$.
(d) It spans but it is linearly dependent