

Readiness Assurance Test

Choose the most appropriate response for each question.

21) 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) $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$

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

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

(d) $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$

22) 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) $\left\{ \begin{bmatrix} -2 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -2 \\ 0 \\ -3 \\ 1 \end{bmatrix} \right\}$

(b) $\left\{ \begin{bmatrix} 1 \\ 2 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 3 \end{bmatrix} \right\}$

(c) $\left\{ \begin{bmatrix} 2 \\ -1 \\ 3 \\ -1 \end{bmatrix} \right\}$

(d) $\left\{ \begin{bmatrix} 1 \\ 2 \\ 1 \\ 5 \end{bmatrix} \right\}$

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

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

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

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

27) Suppose S is a set of \mathbb{R}^5 vectors, and you know that every vector in $\text{span } S$ can be written *uniquely* as a linear combination of the vectors in S . What can you conclude about S ?

- (a) S has exactly 5 vectors
- (b) S has at most 5 vectors
- (c) S has at least 5 vectors
- (d) S could have any number of vectors

28) Suppose you know that every vector in \mathbb{R}^5 can be written as a linear combination of the vectors in a set S . What can you conclude about S ?

- (a) S has exactly 5 vectors
- (b) S has at most 5 vectors
- (c) S has at least 5 vectors
- (d) S could have any number of vectors

29) Suppose you know that every vector in \mathbb{R}^5 can be *uniquely* written as a linear combination of the vectors in a set S . What can you conclude about S ?

- (a) S has exactly 5 vectors
- (b) S has at most 5 vectors
- (c) S has at least 5 vectors
- (d) S could have any number of vectors

30) What else can you conclude about S from the previous question?

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