Readiness Assurance Outcomes

Before beginning this module, each student should be able to...

- Solve a system of linear equations (including finding a basis of the solution space if it is homogeneous) by interpreting as an augmented matrix and row reducing **(Standard(s) E1, E2, E3, E4)**.

- State the definition of a spanning set, and determine if a set of vectors spans a vector space or subspace **(Standard(s) V3)**.

- State the definition of linear independence, and determine if a set of vectors is linearly dependent or independent **(Standard(s) S1)**.

- State the definition of a basis, and determine if a set of vectors is a basis **(Standard(s) S2)**.

Readiness Assurance Resources

The following resources will help you prepare for this module.

- Review the supporting Standards listed above.

Readiness Assurance Test

Choose the most appropriate response for each question.

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

$$x + 3y - z = 2$$
$$2x + 8y + 3z = -1$$
$$-x - y + 9z = -10$$

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

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

$$x + 2y + -z - w = 0$$
$$-2x - 4y + 3z + 5w = 0$$

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

33) 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 $\mathbb{R}^3$.

34) 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 $\mathbb{R}^3$.

35) 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 $\mathbb{R}^3$.

36) 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

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

(a) $n \geq 5$

(b) $n \leq 5$

(c) $n = 5$

(d) n could be any positive integer

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

(a) $n = 5$

(b) n could be any positive integer

(c) $n \leq 5$

(d) $n \geq 5$

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

(a) n could be any positive integer

(b) $n \leq 5$

(c) $n \geq 5$

(d) $n = 5$

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

(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