## Readiness Assurance Test

Choose the most appropriate response for each question.

1) Simplify the following Euclidean vector expression.

$$4\begin{bmatrix}1\\2\\3\end{bmatrix} - 2\begin{bmatrix}1\\2\\3\end{bmatrix}$$

(a) $\begin{bmatrix}1\\-2\\-4\end{bmatrix}$ (b) $\begin{bmatrix}0\\2\\0\end{bmatrix}$ (c) $\begin{bmatrix}1\\2\\3\end{bmatrix}$ (d) $\begin{bmatrix}2\\4\\6\end{bmatrix}$

2) Express the following system of linear equations as an augmented matrix.

$$\begin{aligned} 2x_1 + x_2 + 4x_3 &= 0 \\ x_1 + x_2 + x_3 &= 1 \\ -3x_1 + 4x_2 + x_3 &= -7 \end{aligned}$$

(a) $\left[\begin{array}{cc|c} 2 & 1 & -3 \\ 1 & 1 & 4 \\ 4 & 1 & 1 \\ 0 & 1 & -7 \end{array}\right]$ (b) $\left[\begin{array}{cc|c} 1 & 1 & 1 \\ 1 & -2 & 4 \\ 4 & 1 & 1 \\ 0 & 1 & -7 \end{array}\right]$ (c) $\left[\begin{array}{cc|c} 2 & 1 & 4 \\ 1 & 1 & 1 \\ -3 & 4 & -7 \end{array}\right]$ (d) $\left[\begin{array}{ccc|c} 2 & 1 & 4 & 0 \\ 1 & 1 & 1 & 1 \\ -3 & 4 & 1 & -7 \end{array}\right]$

3) Find RREF $\left[\begin{array}{cc|c} 1 & 2 & 3 \\ 3 & 2 & 5 \\ -2 & 0 & -2 \end{array}\right]$.

(a) $\left[\begin{array}{cc|c} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{array}\right]$ (b) $\left[\begin{array}{cc|c} 1 & 2 & 3 \\ 1 & 3 & 4 \\ 0 & 0 & 0 \end{array}\right]$ (c) $\left[\begin{array}{cc|c} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{array}\right]$ (d) $\left[\begin{array}{cc|c} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array}\right]$

4) Find the solution set of the following system of linear equations.

$$\begin{aligned} 2x_1 + x_2 + 4x_3 &= 0 \\ x_1 + x_2 + x_3 &= 1 \\ -3x_1 + 4x_2 + x_3 &= -7 \end{aligned}$$

(a) $\left\{\begin{bmatrix}1\\-6\\1\end{bmatrix}\right\}$ (b) $\left\{\begin{bmatrix}1+a\\-2\\1+3a\end{bmatrix} \middle| a \in \mathbb{R}\right\}$ (c) $\left\{\begin{bmatrix}2\\0\\-1\end{bmatrix}\right\}$ (d) The system is inconsistent

5) Find the solution set of the following system of linear equations.

$$\begin{aligned} x_1 + \ x_2 + x_3 + x_4 &= 4 \\ 2x_1 + 3x_2 \qquad + x_4 &= 0 \end{aligned}$$

(a) $\left\{ \begin{bmatrix} 1 \\ 2 \\ 0 \\ 1 \end{bmatrix} \right\}$

(b) $\left\{ \begin{bmatrix} 12 - 3a - 2b \\ -8 + 2a + b \\ a \\ b \end{bmatrix} \middle| \, a, b \in \mathbb{R} \right\}$

(c) $\left\{ \begin{bmatrix} 1 \\ 1 + 3a \\ 4 + a \\ -5 + a \end{bmatrix} \middle| \, a \in \mathbb{R} \right\}$

(d) The system is inconsistent

6) How many vectors are required to span all of $\mathbb{R}^4$ (the space of Euclidean vectors with four components)?

(a) 3 (b) 4 (c) 5 (d) Infinitely Many

7) How many vectors are required to span all of $\mathcal{P}^3$ (the space of polynomials of degree three or less)?

(a) 3 (b) 4 (c) 5 (d) Infinitely Many

8) Which vector is a linear combination of $\begin{bmatrix} -3 \\ 2 \\ 1 \\ 0 \end{bmatrix}$ and $\begin{bmatrix} -2 \\ 1 \\ 0 \\ 1 \end{bmatrix}$?

(a) $\begin{bmatrix} 1 \\ 2 \\ 4 \\ 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 \\ 0 \\ 3 \\ -7 \end{bmatrix}$ (c) $\begin{bmatrix} -5 \\ 3 \\ 1 \\ 1 \end{bmatrix}$ (d) $\begin{bmatrix} 2 \\ 2 \\ 0 \\ 1 \end{bmatrix}$

9) Which vector belongs to span $\left\{ \begin{bmatrix} -3 \\ 2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -2 \\ 1 \\ 0 \\ 1 \end{bmatrix} \right\}$?

(a) $\begin{bmatrix} 3 \\ -7 \\ 1 \\ 1 \end{bmatrix}$ (b) $\begin{bmatrix} 4 \\ 1 \\ 2 \\ 3 \end{bmatrix}$ (c) $\begin{bmatrix} 0 \\ 1 \\ 2 \\ -3 \end{bmatrix}$ (d) $\begin{bmatrix} -1 \\ -1 \\ 0 \\ 0 \end{bmatrix}$

10) What best describes span $\left\{ \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \right\}$ in three-dimensional Euclidean space $\mathbb{R}^3$?

(a) a line (b) a plane (c) a sphere (d) all of $\mathbb{R}^3$