EXERCISES

For Exercises 1–6, find three vectors that are in the span of the given vectors.

1. $\mathbf{u}_1 = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$; $\mathbf{u}_2 = \begin{bmatrix} 9 \\ 15 \end{bmatrix}$

2. $\mathbf{u}_1 = \begin{bmatrix} -2 \\ 7 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} -3 \\ 4 \end{bmatrix}$

3. $\mathbf{u}_1 = \begin{bmatrix} 2 \\ 5 \\ -3 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} 1 \\ 0 \\ 4 \end{bmatrix}$

4. $\mathbf{u}_1 = \begin{bmatrix} 0 \\ 5 \\ -2 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} 1 \\ 2 \\ 6 \end{bmatrix}$, $\mathbf{u}_3 = \begin{bmatrix} -6 \\ 7 \\ 2 \end{bmatrix}$

5. $\mathbf{u}_1 = \begin{bmatrix} 2 \\ 0 \\ 0 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} 4 \\ 1 \\ 6 \end{bmatrix}$, $\mathbf{u}_3 = \begin{bmatrix} -4 \\ 0 \\ 7 \end{bmatrix}$

6. $\mathbf{u}_1 = \begin{bmatrix} 0 \\ 1 \\ 3 \\ 0 \end{bmatrix}$, $\mathbf{u}_2 = \begin{bmatrix} -1 \\ 8 \\ -5 \\ 2 \end{bmatrix}$, $\mathbf{u}_3 = \begin{bmatrix} 12 \\ -1 \\ 1 \\ 0 \end{bmatrix}$

For Exercises 7–12, determine if $\mathbf{b}$ is in the span of the other given vectors. If so, write $\mathbf{b}$ as a linear combination of the other vectors.

7. $\mathbf{a}_1 = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 9 \\ -15 \end{bmatrix}$

8. $\mathbf{a}_1 = \begin{bmatrix} 10 \\ -15 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} -30 \\ 45 \end{bmatrix}$

9. $\mathbf{a}_1 = \begin{bmatrix} 4 \\ -2 \\ 10 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 2 \\ -1 \\ -5 \end{bmatrix}$

10. $\mathbf{a}_1 = \begin{bmatrix} -1 \\ 3 \\ -1 \end{bmatrix}$, $\mathbf{a}_2 = \begin{bmatrix} -2 \\ -3 \\ 6 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} -6 \\ 9 \\ 2 \end{bmatrix}$

11. $\mathbf{a}_1 = \begin{bmatrix} -1 \\ 4 \\ -3 \end{bmatrix}$, $\mathbf{a}_2 = \begin{bmatrix} 2 \\ 8 \\ -7 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} -10 \\ -8 \\ 7 \end{bmatrix}$

12. $\mathbf{a}_1 = \begin{bmatrix} 3 \\ 1 \\ -2 \\ -1 \end{bmatrix}$, $\mathbf{a}_2 = \begin{bmatrix} -4 \\ 2 \\ 3 \\ 3 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 0 \\ 10 \\ 1 \\ 5 \end{bmatrix}$

In Exercises 13–16, find A, $\mathbf{x}$, and $\mathbf{b}$ such that $A\mathbf{x} = \mathbf{b}$ corresponds to the given linear system.

13. $$\begin{aligned} 2x_1 + 8x_2 - 4x_3 &= -10 \\ -x_1 - 3x_2 + 5x_3 &= 4 \end{aligned}$$

14. $$\begin{aligned} -2x_1 + 5x_2 - 10x_3 &= 4 \\ x_1 - 2x_2 + 3x_3 &= -1 \\ 7x_1 - 17x_2 + 34x_3 &= -16 \end{aligned}$$

15. $$\begin{aligned} x_1 - x_2 - 3x_3 - x_4 &= -1 \\ -2x_1 + 2x_2 + 6x_3 + 2x_4 &= -1 \\ -3x_1 - 3x_2 + 10x_3 &= 5 \end{aligned}$$