§1.3 Classwork

1. Let

$$A = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ 1 & -2 & 1 \end{bmatrix} \quad \text{and} \quad \mathbf{b} = \begin{bmatrix} 10 \\ 3 \\ 3 \end{bmatrix}.$$

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   Let W be the span of the columns of A. Is $\mathbf{b} \in W$?

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2. Let

$$\mathbf{a}_1 = \begin{bmatrix} 1 \\ -2 \\ 2 \end{bmatrix}, \ \mathbf{a}_2 = \begin{bmatrix} 0 \\ 5 \\ 5 \end{bmatrix}, \ \mathbf{a}_3 = \begin{bmatrix} 2 \\ 0 \\ 8 \end{bmatrix}, \text{ and } \mathbf{b} = \begin{bmatrix} -5 \\ 11 \\ 7 \end{bmatrix}.$$

Classwork

2. Let

$$\mathbf{a}_1 = \begin{bmatrix} 1 \\ -2 \\ 2 \end{bmatrix}, \ \mathbf{a}_2 = \begin{bmatrix} 0 \\ 5 \\ 5 \end{bmatrix}, \ \mathbf{a}_3 = \begin{bmatrix} 2 \\ 0 \\ 8 \end{bmatrix}, \text{ and } \mathbf{b} = \begin{bmatrix} -5 \\ 11 \\ 7 \end{bmatrix}.$$

Do there exist scalars $x_1, x_2, x_3 \in \mathbb{R}$ such that

$$x_1\mathbf{a}_1 + x_2\mathbf{a}_2 + x_3\mathbf{a}_3 = \mathbf{b}?$$

Classwork

Bonus (§1.3 #29, 30). Let $\mathbf{v}_1, \ldots, \mathbf{v}_k$ be points in $\mathbb{R}^3$ and suppose that for each $j = 1, \ldots, k$ there is an object of mass m_j located at the point $\mathbf{v}_j$. Let $m = m_1 + \cdots + m_k$ be the sum of all the masses.

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(a) Can you come up with a formula for the location of the center of mass of the system?

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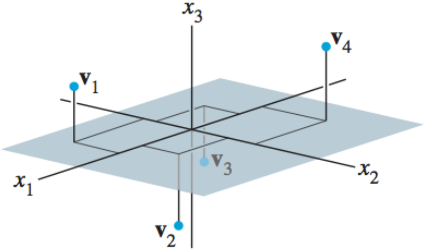
(a) Can you come up with a formula for the location of the center of mass of the system?

$$\underline{\mathbf{v}} = \frac{1}{m}(m_1\mathbf{v}_1 + \cdots + m_k\mathbf{v}_k)$$

(b) Compute the center of mass of the following system.

Point	Mass
$\mathbf{v}_1 = (5, -4, 3)$	2 g
$\mathbf{v}_2 = (4, 3, -2)$	5 g
$\mathbf{v}_3 = (-4, -3, -1)$	2 g
$\mathbf{v}_4 = (-9, 8, 6)$	1 g



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(c) Is the center of mass in the span of $\mathbf{v}_1, \ldots, \mathbf{v}_k$? Why or why not?