Linjär Algebra
Vektorer

Ali Leylani
2025-12-08

Vector Operations

For problems 1–8, graph the relevant vectors (i.e., the ones that are being added or subtracted), alongside the resulting vector, in an xy-coordinate system.

1. Given vectors $\mathbf{a} = \begin{bmatrix} 2 \\ -1 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} -3 \\ 4 \end{bmatrix}$, and a scalar $k = 2$, compute $k\mathbf{a} + 3\mathbf{b}$.

2. Given vectors $\mathbf{c} = \begin{bmatrix} 4 \\ -2 \end{bmatrix}, \mathbf{d} = \begin{bmatrix} -1 \\ m \end{bmatrix}$, and $m = 3$, find $4\mathbf{c} - 2\mathbf{d}$.

3. Given vectors $\mathbf{e} = \begin{bmatrix} 1 \\ 5 \end{bmatrix}, \mathbf{f} = \begin{bmatrix} -2 \\ 3 \end{bmatrix}$, and $n = -2$, compute $3\mathbf{e} + 5\mathbf{f} - n\mathbf{e}$.

4. For vectors $\mathbf{g} = \begin{bmatrix} 3 \\ -4 \end{bmatrix}, \mathbf{h} = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$, calculate $-2\mathbf{g} + 4\mathbf{h}$.

5. Determine $\mathbf{i} = \begin{bmatrix} -q \\ q \end{bmatrix}, \mathbf{j} = \begin{bmatrix} 3 \\ -5 \end{bmatrix}$, if $q = 4$, then solve for $\frac{3}{2}\mathbf{i} + 2\mathbf{j} - \frac{1}{2}\mathbf{i}$.

6. Given vectors $\mathbf{k} = \begin{bmatrix} 4 \\ -3 \end{bmatrix}, \mathbf{l} = \begin{bmatrix} -2 \\ 6 \end{bmatrix}$, compute $3\mathbf{k} - 2\mathbf{l} + \mathbf{k}$.

7. For vectors $\mathbf{m} = \begin{bmatrix} -5 \\ 2 \end{bmatrix}, \mathbf{n} = \begin{bmatrix} 1 \\ -4 \end{bmatrix}$, and $s = 2$, find $2\mathbf{m} + \mathbf{n} - \frac{3}{s}\mathbf{m}$.

8. Determine $\mathbf{o} = \begin{bmatrix} t \\ -t \end{bmatrix}, \mathbf{p} = \begin{bmatrix} -t \\ t \end{bmatrix}$, if $t = -4$, then solve for $-\frac{1}{2}\mathbf{o} + 2\mathbf{p} - \frac{3}{2}\mathbf{o}$.

For problems 9–10, just compute what's asked. No need to plot vectors on an xyz-coordinate system – unless you'd like to of course.

9. Given vectors $\mathbf{q} = \begin{bmatrix} u^2 \\ 4 \\ 3 \end{bmatrix}, \mathbf{r} = \begin{bmatrix} -3 \\ 0 \\ 2 \end{bmatrix}$, and $u = 2$, compute $4\mathbf{q} + \frac{1}{2}\mathbf{r} - \mathbf{r}$.

10. For vectors $\mathbf{s} = \begin{bmatrix} 3 \\ -1 \\ v \end{bmatrix}, \mathbf{t} = \begin{bmatrix} -2 \\ 5 \\ v \end{bmatrix}$, and $v = -2$, find $\frac{1}{2}\mathbf{s} - 3\mathbf{t} + 2\mathbf{s}$.

11. For problem 1–10, now also compute the length of the resulting vectors.