

Given that $\mathbf{u} = \langle 2, -1 \rangle$ and $\mathbf{w} = \langle 1, 2 \rangle$, find the following.

1. $\mathbf{v} = \frac{3}{2}\mathbf{u}$

Solution: $\vec{v} = \frac{3}{2} \langle 2, -1 \rangle$

$$= \langle 3, -\frac{3}{2} \rangle$$

2. $\mathbf{v} = \mathbf{u} + \mathbf{w}$

Solution:

$$\vec{v} = \langle 2, -1 \rangle + \langle 1, 2 \rangle$$

$$= \langle 2+1, -1+2 \rangle$$

$$= \langle 3, 1 \rangle$$

3. $\mathbf{v} = \mathbf{u} + 2\mathbf{w}$

Solution:

$$\vec{v} = \langle 2, -1 \rangle + 2 \langle 1, 2 \rangle$$

$$= \langle 2 + 2(1), -1 + 2(2) \rangle$$

$$= \langle 4, 3 \rangle$$

4. $\mathbf{v} = 5\mathbf{u} - 3\mathbf{w}$

Solution:

$$\begin{aligned}\vec{v} &= 5\langle 2, -1 \rangle - 3\langle 1, 2 \rangle \\ &= \langle 10, -5 \rangle + \langle -3, -6 \rangle \\ &= \langle 7, -11 \rangle\end{aligned}$$

5. $\|\mathbf{u}\|$

Solution:

$$\begin{aligned}\|\mathbf{u}\| &= \sqrt{u_1^2 + u_2^2} \\ &= \sqrt{(2)^2 + (-1)^2} \\ &= \sqrt{5}\end{aligned}$$

6. $\|\mathbf{u} + \mathbf{w}\|$.

Solution:

$$\begin{aligned}\|\mathbf{u} + \mathbf{w}\| &= \|\langle 3, 1 \rangle\| \\ &= \sqrt{(3)^2 + (1)^2} \\ &= \sqrt{10}\end{aligned}$$