
Exercise 1 True or False? If False, you should come up with a counterexample. If True, can you give a proof?

1. The zero vector is the only vector of length 0.

Multiple Choice:

- (i) True
- (ii) False

2. If $\|\mathbf{v} - \mathbf{w}\| = 0$, then $\mathbf{v} = \mathbf{w}$.

Multiple Choice:

- (i) True
- (ii) False

3. If $\mathbf{v} = -\mathbf{v}$, then $\mathbf{v} = \mathbf{0}$.

Multiple Choice:

- (i) True
- (ii) False

4. If $\|\mathbf{v}\| = \|\mathbf{w}\|$, then $\mathbf{v} = \mathbf{w}$.

Multiple Choice:

- (i) True
- (ii) False

5. If $\|\mathbf{v}\| = \|\mathbf{w}\|$, then $\mathbf{v} = \pm\mathbf{w}$.

Multiple Choice:

- (i) True
- (ii) False

6. If $\mathbf{v} = t\mathbf{w}$ for some scalar t , then $\mathbf{v}$ and $\mathbf{w}$ have the same direction.

Multiple Choice:

- (i) True
- (ii) False

7. If $\mathbf{v}$, $\mathbf{w}$ and $\mathbf{v} + \mathbf{w}$ are non-zero, and $\mathbf{v}$ is parallel to $\mathbf{v} + \mathbf{w}$, then $\mathbf{v}$ and $\mathbf{w}$ are also parallel.

Multiple Choice:

- (i) True
- (ii) False

8. $\|\mathbf{v} + \mathbf{w}\| = \|\mathbf{v}\| + \|\mathbf{w}\|$

Multiple Choice:

- (i) True
- (ii) False

Source

[Nicholson] W. Keith Nicholson, *Linear Algebra with Applications*, Lyryx 2021, Open Edition, Problem 4.1.21.