

3D Vectors and Vector Triangles

Given:

$$\mathbf{a} = \hat{i} + 3\hat{j} - 5\hat{k}$$

$$\mathbf{b} = 2\hat{i} + 8\hat{j} - 5\hat{k}$$

$$\mathbf{c} = -10\hat{i} + 2\hat{j} - \hat{k}$$

$$\mathbf{d} = 7\hat{i} - 12\hat{k}$$

$$\mathbf{e} = \hat{i} + \hat{j} + \hat{k}$$

$$\mathbf{f} = -2.2\hat{i} + 7.3\hat{j} + 2\hat{k}$$

1. Determine which octant contains each vector.
2. Determine the magnitude of each vector.

3. $\mathbf{a} + \mathbf{e} - 2\mathbf{b}$

4. $\mathbf{f} + \mathbf{c} + 1.5\mathbf{e}$

5. $2\mathbf{d} - \mathbf{e} + \mathbf{c}$

6. $\mathbf{e} + \mathbf{f} + \mathbf{a}$

7. $1.75\mathbf{a} + 1.9\mathbf{b} - \mathbf{d}$

8. $-3\mathbf{c} + \mathbf{b}$

Given:

$$\mathbf{t} = 2\hat{i} + 7\hat{j}$$

$$\mathbf{z} = -9\hat{i} - 19\hat{j}$$

$$\mathbf{s} = -10\hat{i} + 2\hat{j}$$

$$\mathbf{w} = 7\hat{i} - 12\hat{j}$$

9. Determine the angle between \mathbf{t} and \mathbf{z} , \mathbf{z} and \mathbf{s} , and \mathbf{s} and \mathbf{w} . Draw the three systems.
10. Vectors \mathbf{z} and \mathbf{w} form the legs of a non-right triangle. Draw this triangle and determine its area.

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