

Vector Operations

The vectors $\mathbf{a} = 3\hat{i} - 4\hat{j}$, $\mathbf{b} = 5\hat{i} + 9\hat{j}$, and $\mathbf{c} = -7.54\hat{i} + 19.3\hat{j}$ are given. If it can be said that $\mathbf{a} + \mathbf{b} = 8\hat{i} + 5\hat{j}$, determine:

- | | | |
|--------------------------------|--------------------------------|--------------------------------------------|
| 1. $\mathbf{a} + 2\mathbf{b}$ | 2. $\mathbf{b} - \mathbf{a}$ | 3. $-3\mathbf{b} + \mathbf{a}$ |
| 4. $3\mathbf{a} - 2\mathbf{b}$ | 5. $2\mathbf{a} + 2\mathbf{b}$ | 6. $2\mathbf{b} - \mathbf{b}$ |
| 7. $\mathbf{a} + \mathbf{c}$ | 8. $-\mathbf{c} + \mathbf{b}$ | 9. $\mathbf{c} + 2\mathbf{b} - \mathbf{a}$ |

Draw the system that has resulted from these combinations.

Determine the magnitude $[\sqrt{(\text{horizontal})^2 + (\text{vertical})^2}]$ and direction $[\theta = \tan^{-1}(V/H)]$ of these vectors:

- | | | |
|---------------------------|----------------------------|------------------------------|
| 1. $5\hat{i} + 9\hat{j}$ | 2. $10\hat{i} + 18\hat{j}$ | 3. $-2.22\hat{i} - 3\hat{j}$ |
| 4. $-3\hat{i} + 8\hat{j}$ | 5. $5\hat{i} - 22\hat{j}$ | 6. $15.11\hat{i} - 4\hat{j}$ |

Draw the systems.

Any theories on how to make sense of the angle values for vectors not in Quadrant I?

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