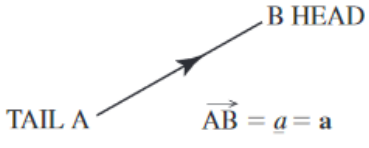
Ch 26 Vectors (C)

Introduction to Vectors and Scalars

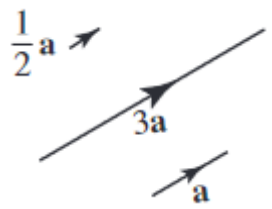
Magnitude: single number. i.e. 3 km 3 is the magnitude

Scalars: quantities that can be described by a single number. I.e. temperature, length, volume, density…

A vector has both magnitude and direction.

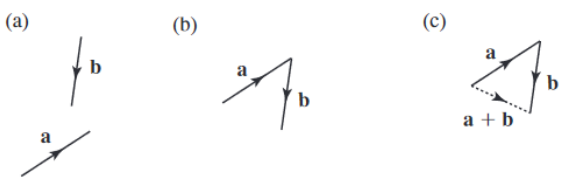


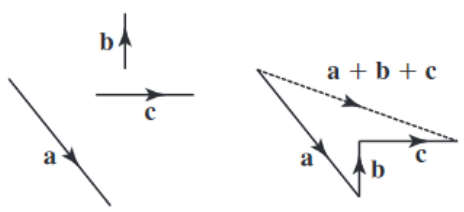
Multiplying a vector by a scalar



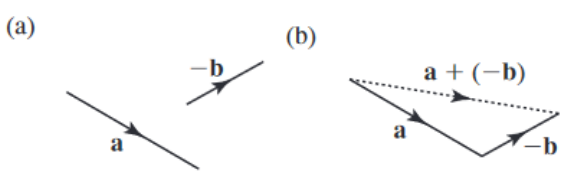
Adding and subtracting vectors

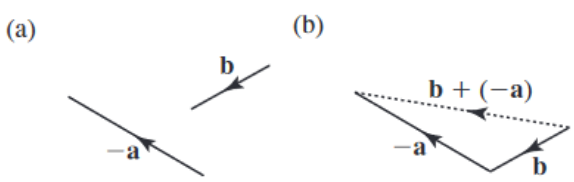
The resultant of **a** and **b** is the sum **a** + **b**.





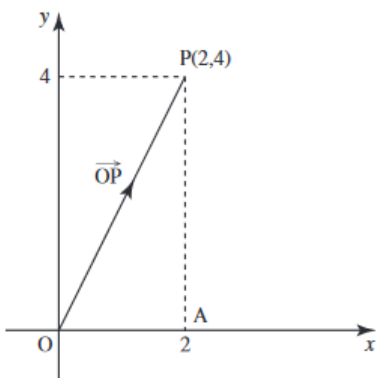
Subtraction of vectors: a + (-b)





Representing vectors using Cartesian components

The unit vectors in the x and y directions are **i** and **j** respectively.



The vector $\overrightarrow{OP}$ is 2i + 4j

If **r** = x**i** + y**j**, then $|\mathbf{r}| = \sqrt{x^2 + y^2}$

The scalar product (dot product)

Given two vectors, $\mathbf{a}$ and $\mathbf{b}$, their scalr product, denoted by $\mathbf{a} \cdot \mathbf{b}$, is given by
$\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}||\mathbf{b}| \cos\theta$
where θ is the angle between $\mathbf{a}$ and $\mathbf{b}$.

$\mathbf{i} \cdot \mathbf{i} = 1 \quad \mathbf{j} \cdot \mathbf{j} = 1 \quad \mathbf{i} \cdot \mathbf{j} = 0 \quad \mathbf{j} \cdot \mathbf{i} = 0$

If $\mathbf{a} = a_1\mathbf{i} + a_2\mathbf{j},\ \mathbf{b} = b_1\mathbf{i} + b_2\mathbf{j}$ then
$\mathbf{a} \cdot \mathbf{b} = a_1b_1 + a_2b_2$