MCV4U

CALCULUS & VECTORS

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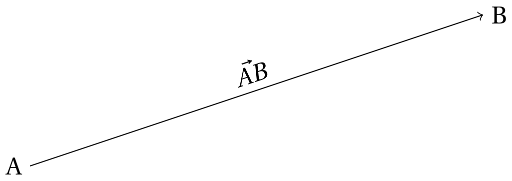
1 Vectors

Vectors are mathematical entities that extend our understanding beyond the one-dimensional quantities. Unlike scalar values that only have magnituide, vectors incorporate both magnitude and direction, offering a versatile toolkit for describing dynamic sytstems.

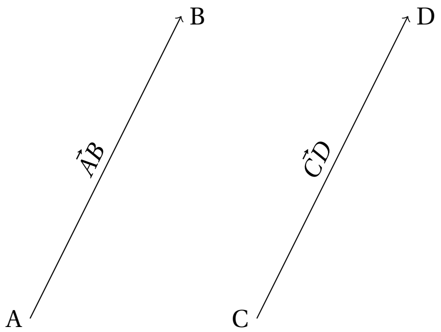
- **Scalar Quantities:** Mass, Temperature, Time, Distance, Speed, Energy, Work, Power, etc.
- **Vector Quantities:** Displacement, Velocity, Acceleration, Force, Momentum, etc.

When written in mathematical equations, vectors are usually represented via a a symbol with a vector indicator (i.e $\vec{v}$) or via a jointery of the two points (i.e $\vec{AB}$ is a vector from point A to point B) Vectors can also be represented in many other ways, but the most common ways are: algebraically and geometrically. Below are examples of each:

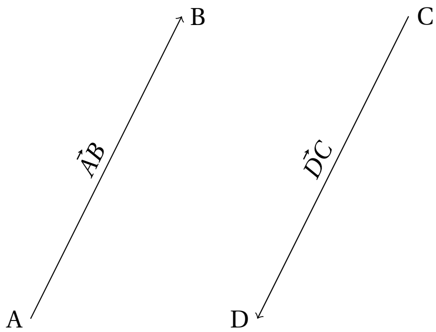
- **Algebraically:** $\vec{a} = [a, b, c]$ [1]
- **Geometrically:**



Vectors can be equal (or equivalent) to each other. For two vectors to be equal (or equivalent) they must have the same magnitude and direction. Vectors can also be opposite to each other; to be opposing vectors must have the same magnitude but opposite directions (i.e $\vec{v} = -\vec{v}$).



(a) Equivalent Vectors



(b) Equivalent Vectors

[1] Vectors represented algebraically can also be written in column matrices

1.1 Vector Addition and Substraction

1.2 Scalar Multiplication

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