

Reference Sheet for Test 1

1 S2:

Definition

Kinematics is the study of the motion of an object.

Definition

The **distance** traveled by an object is the total length of the path it traversed.

Definition

The **direction** of an object is an indication of its location according to some system.

Definition

A **scalar** is a quantity that has a magnitude (size) *only*.

Definition

A **vector** is a quantity that has a magnitude as well as an associated direction. We denote a variable who represents a vector with an arrow, \rightarrow .

Definition

Position, \vec{d} , is the distance and direction of an object from a particular *reference point*.

Definition

The **displacement** of an object is the change in its position.

$$\Delta \vec{d} = \vec{d}_f - \vec{d}_i$$

Corollary

If an object changes its position more than once, the *net* or *total* displacement of the object is computed as,

$$\Delta \vec{d}_T = \vec{d}_F - \vec{d}_I$$

Where \vec{d}_F , \vec{d}_I are the final and initial position vectors respectively.

Theorem

The **distance** covered by an object is the sum of all displacements along its path

$$d = \sum_i |\overrightarrow{\Delta d_i}|$$

Definition

To add two vectors, $\vec{A} + \vec{B}$, *Geometrically*, we place the *tail* of \vec{B} to the *tip* of \vec{A} .

Definition

For a vector \vec{A} , we define $\overrightarrow{-A}$ to be the vector such that $\vec{A} + (\overrightarrow{-A}) = \vec{0}$.

Proposition

For reference points A, B, C ,

$$\vec{d}_{AC} = \vec{d}_{AB} + \vec{d}_{BA}$$

2 S3:

Definition

The **average speed** of an object is the ratio of the total distance traveled to the time elapsed.

$$v_{av} = \frac{d}{\Delta t}$$

Here $\Delta t = t_f - t_i$, or in other words the elapsed time.

Definition

The **average velocity** of an object is the ratio of the displacement to the time elapsed

$$\vec{v}_{av} = \frac{\overrightarrow{\Delta d}}{\Delta t}$$

Definition

A **position-time graph** is a graph of position versus time. We plot a set of position vectors on the vertical axes with their corresponding time on the horizontal axes.

Definition

Uniform motion (Or constant velocity) is motion where the velocity is fixed.

Definition

Non-uniform motion (Or accelerated motion) is motion where the velocity is *not* fixed.

Proposition

Given a **Linear** Position v. Time plot of a moving body, the slope m represents the average velocity of the body.