# 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 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 $A, B$,

$$-\vec{d}_{AB} = \vec{d}_{BA}$$

**Proposition**
For reference points $A, B, C$,

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

# 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.