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,

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

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.