**Dynamics**

**3.1 Aristotle’s Law of Motion**

For a body to move, some kind of **force** needs to interact with it.

Aristotle tried to write equations of motion but in his era calculus wasn’t yet a thing, so he made some wrong conclusions due to that fact.

He wrongly stated that the velocity of an object is proportional to the total applied force. Furthermore, he stated that the Applied force on an object is proportional to its velocity and proportional to its mass.

With some easy calculus, we can see that this equation isn’t illegal. The problem is that they are simply wrong!

**3.2 Mass Acceleration and Force**

To keep an object moving, the **applied force** needs to overcome that of **friction.**

**Law of inertia:** An isolated object moving in free space with no forces acting on it, requires nothing to keep moving and needs a force to stop its motion.

Generally, an object that moves through space with no forces acting on it will keep its kinetic energy unless an external force acts upon it.

Different objects ave different inertias.

The quantitative measurement of an object’s inertia is its **mass**.

Mass is defined in terms of force and acceleration.

**Force is defined by the ability to change the motion of a given mass, and mass is defined by the resistance to that force.**

That is Newton’s second law of motion.

Or

**Force equals mass times the rate of change of velocity.**

**3.3 Some Examples of solving Newtons equations**

**Example 1**

Consider a particle with no forces acting upon it

Since the velocity components are constant and don’t change through time, we can set them to their initial values, 0

**So**

That transitions us smoothly to Newtons First Law:

**Every Object in a stat of uniform velocity tends to remain in that state of motion unless an external force is applied to it.**

The first law is simply a special case of the second law, meaning that uniform velocity means that it doesn’t change through time so acceleration is equal to 0 which in that case means that there is no force acted upon it that could change its trajectory.