Name:_____ Date:_____

Mr. Croom's Physics Chapter 2: One Dimensional Motion

Graphical Interpretation Ideas

About Position

- The position of an object is **where the object is** (you know this).
- The position of an object can be changed, over time, **only** if the object has a velocity, and/or an acceleration.
- **An object with zero velocity and zero acceleration will NEVER move**.

About Velocity

- Velocity is simply **how fast** an object is moving in a particular direction (or speed with direction).
- Velocity can only be changed, over time, by an acceleration.
- An object can have velocity even though its acceleration is zero.
- The velocity of an object will not change if it has zero acceleration.
- If **velocity and acceleration have the same signs** (both + or both –), the object will keep speeding up in the direction in which it is already moving.
- If **velocity and acceleration have opposite signs** (one + and one –), the object will slow down in the direction in which it is moving, eventually stop, turn around, and begin speeding up in the opposite direction.
- **The only way to change the direction an object is traveling in is to give it an acceleration with the numerically opposite sign as the velocity.**

About Acceleration

- An object with a **zero acceleration** always moves at the **same constant velocity**.
- An object with a **positive acceleration** can do one of the following:
  a) The object can go faster and faster forward.
  b) The object can be moving backwards slowing down and eventually stopping.
- An object with a **negative acceleration** can do one of the following:
  a) The object can move forward but is slowing down.
  b) The object can be moving backwards but is getting faster in the backward direction.

Position vs. Time (x–t) graphs:

1. An x–t graph answers the questions how far an object has traveled and in which direction(s) the object has traveled.
2. The slope of an x–t graph over a period of time gives the average velocity of an object.
3. The slope of a tangent line to an x–t curve gives the instantaneous velocity at a particular moment in time.
4. Positive x values indicate the object is located to the right of the origin on the x-axis, while negative x values indicate the object is located to the left of the origin on the x-axis.

Velocity vs. Time (v–t) graphs:

1. A v–t graph answers the questions how fast the object is traveling, how fast the object is accelerating, in which direction the object is traveling, and how far the object has traveled (displacement) using **AUTC**.
2. The slope of a v–t graph over a period of time gives the average acceleration of an object.
3. The slope of a tangent to a v–t curve gives the instantaneous acceleration at a particular moment in time.
4. Positive v values indicate forward motion, while negative v values indicate backward motion.

Acceleration vs. Time (a–t) graphs:

1. An a–t graph answers the questions how fast the object is accelerating or if it is accelerating at all.
2. In introductory physics classes such as ours, an a–t graph will only have a ZERO slope, but may have a positive, negative, or ZERO y-intercept.
3. The y-intercept on an a–t graph indicates the average acceleration of the object.
4. The velocity of an object can be determined from an a–t graph by using **AUTC**.