Module #1 Motion In One Dimension

* Distance and Displacement
	+ Displacement is the change in an object’s position
		- The difference between the starting and ending points
		- Includes information about direction
		- Vector quantity is a physical measurement that contains directional information
		- Scalar quantity is a physical measurement that does not contain directional information
			* Ex: Distance
		- We label displacement in one direction positive and displacement in the opposite direction as negative
			* Does not matter which way is positive/negative as long as you keep it consistent
		- Example 1.1 p.8
* Speed and Velocity
	+ Velocity is the time rate of change of an object’s position
		- Tells us how quickly an object’s position is changing
		- v = Δx / Δt
			* Δ represents the capital Greek letter delta and means “change in”
			* x represents position
			* t represents time
		- Change in position means displacement
		- The SI unit for velocity is meters per second (m/s)
		- Velocity is also a vector quantity
		- Direction is indicated by positive and negative
			* Motion in one direction is positive and the opposite direction is negative
		- Time does not have a direction attached to it, a scalar quantity
	+ Speed is the time rate of change of the distance traveled by an object
		- Speed = Δd / Δt
			* d represents distance
			* t represents time
			* no vector quantities
		- Speed is a scalar quantity
		- Example 1.2 p.10
		- Example 1.3 p. 12
* Average and Instantaneous Velocity
	+ Instantaneous velocity is the velocity of an object at one moment in time
	+ Average velocity is the velocity of an object over an extended period of time
	+ Experiment 1.1 p.14
	+ Position vs. Time graph
		- Can be used to estimate instantaneous velocity
		- The position of an object is plotted on the y-axis
		- Time is plotted on the x-axis
		- The curve represents an object’s position at various time intervals
		- Shows movement of object in positive and negative directions
		- Can determine velocity by interpreting the graph
			* Take the change in position (displacement) and divide it by the change in time
				+ The change in y coordinates / the change in x coordinates
			* The slope of a position versus time curve is the velocity
				+ We can estimate the instantaneous velocity by estimating the slope of the curve at a single point
				+ The steeper the curve, the larger the slope
				+ The sign (positive or negative) refers to the direction of the motion

A maximum speed can have a negative sign

* + - * + A flat curve is a slope of zero
		- Example 1.4 p19
* Velocity is Relative
	+ Ex: p. 21: backing out of the driveway
	+ Velocity depends on who is observing that velocity
		- Velocity can only be determined relative to an observer
	+ What an observer actually sees is the difference between his velocity and the velocity of what he is observing.
		- Take the velocity of the thing being observed and subtract from it the velocity of the observer
	+ Example 1.5 p.22
* Acceleration
	+ Acceleration is the time rate of change of an object’s velocity
		- Measures how an object’s velocity changes with time
		- a = Δv / Δt
	+ Acceleration is a vector quantity
	+ SI unit of acceleration is meters per second squared (m/s2)
	+ Acceleration can mean either “speed up” or “slow down”
		- If acceleration and velocity have opposite signs, the object is slowing down
		- If acceleration and velocity have identical signs, the object is speeding up
	+ Experiment 1.2 p.24
	+ Example 1.6 p.25
* Average and Instantaneous Acceleration
	+ When the time interval is large, acceleration is an average
	+ When the time interval is infinitely short, the acceleration is instantaneous
		- The only way to determine instantaneous acceleration is by studying graphs
	+ Velocity vs. time graph
		- Plot velocity on the y-axis
		- Plot time on the x-axis
		- The slope of the curve will be acceleration
		- Use the same methods to analyze as with position vs. time graphs
	+ Example 1.7 p.28
		- The area under the curve represents the object’s displacement
			* Learn in calculus
	+ If velocity is zero, acceleration does not have to be zero
	+ If acceleration is zero, velocity does not have to be zero
* Review questions p. 34
* Practice problems p.35