$\qquad$ Hour $\qquad$

## Moo Motion and Graphs

http://jersey.uoregon.edu/vlab/block/Block.html
Introduction: This simulation allows you to view the motion of a cow-on-skates based on the initial position (Initial P), initial speed (Initial V), and acceleration (Initial A) parameters you establish. The simulation also provides a velocity vector to be seen above the cow as the simulation runs. During the movement of the cow two graphs plot the motion in real-time. The graph on the left is a position-time graph and the other is a velocity-time graph. Plotted data can be determined by placing the cursor on the graphed plot.
Parameter setting range of values:
Initial Position has a range from 0 to 60 .
Initial Velocity has a range from 0 to 100.
Initial Accelerations has a range from -100 to 100 .
Note: The above values are not assigned units. You may assume they are meters, meters/s, and meters/second ${ }^{2}$.

## Lab 1: Constant Speed

To achieve constant speed the acceleration must be set to zero. Complete the table below and observe the nature of both graphs that are plotted:

| Trial | Initial P | Initial V | Initial A | Distance <br> Traveled | Time |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 0 | 5 | 0 |  |  |
| 2 | 0 | 10 | 0 |  |  |
| 3 | 0 | 15 | 0 |  |  |
| 4 | 0 | 20 | 0 |  |  |

1. Describe the plotted data for the position-time graph:
(Possible answers to \#1: Straight-line, Curved or parabolic, no slope, positive slope, negative slope)
Draw or sketch the graph pattern:

2. Describe the plotted data for the velocity-time graph: $\qquad$
Draw or sketch the graph pattern:

3. Which trial graph above had the greatest slope? $\qquad$
4. Which graph above had no slope?
5. What does the slope of a distance-time graph measure? $\qquad$
6. How does a velocity-time graph show constant speed? $\qquad$
Critical Thinking:
7. How can a greater speed be determined on a position-time graph?
8. How can a greater speed be determined on a velocity-time graph?
9. How does the cow or any object move when the acceleration is zero? $\qquad$ (constant velocity or changing velocity)

Lab 2: Constant Acceleration from Rest
To begin at rest the initial V must be zero. Complete the table below and observe the nature of both graphs that are plotted:

| Trial | Initial P | Initial V | Initial A | Distance <br> Traveled | Time |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 0 | 0 | 1 |  |  |
| 2 | 0 | 0 | 5 |  |  |
| 3 | 0 | 0 | 10 |  |  |
| 4 | 0 | 0 | 20 |  |  |

1. Describe the plotted data for the position-time graph:
(Possible answers to \#1: Straight-line, Curved or parabolic, no slope, positive slope, negative slope) Draw or sketch the graph pattern:

2. Describe the plotted data for the velocity-time graph: $\qquad$ Draw or sketch the graph pattern:

3. Which graph had a constant slope illustrated by a straight line? $\qquad$
4. Which trial allowed the cow to travel 60 meters in the shortest period of time? $\qquad$
Why? $\qquad$
5. When the acceleration is not zero, what happens to the speed of the cow over time?

6 . What is acceleration in terms of the cow's motion? $\qquad$
$\qquad$

## Lab 3: Constant Negative Acceleration with a positive initial velocity

Negative acceleration is deceleration. The cow will move to the right initially and decrease it speeds over time. Complete the table below and observe the nature of both graphs that are plotted:

| Trial | Initial P | Initial V | Initial A | Distance <br> Traveled | Time |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 0 | 20 | -20 |  |  |
| 2 | 0 | 20 | -10 |  |  |
| 3 | 0 | 20 | -5 |  |  |
| 4 | 0 | 20 | -2 |  |  |

1. Describe the plotted data for the position-time graph: $\qquad$
Draw or sketch the graph pattern:
2. Describe the plotted data for the velocity-time graph: $\qquad$
Draw or sketch the graph pattern:
3. Which graph had a constant slope illustrated by a straight line? $\qquad$
Is the slope positive or negative? $\qquad$
4. Where on the position-time graph does the cow stop its forward motion to the right?
5. Where on the velocity-time graph does the cow stop its forward motion to the right?
6. What does negative acceleration do to an object with an initial positive velocity?
7. If moving to the right is positive velocity, what is the velocity when the cow moves to the left?
8. What is negative acceleration? $\qquad$
9. Do the brakes on an automobile provide positive or negative acceleration to a moving car?
$\qquad$ Is the brake's acceleration constant? $\qquad$
