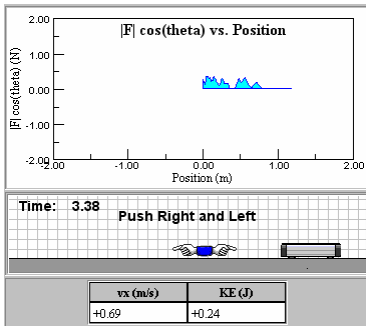


## Worksheet for Exploration 6.1: An Operational Definition of Work



This Exploration allows you to discover how work causes changes in kinetic energy. [Restart](#).

Drag "handy" to the front and/or the back of the cart to impart a force (**position is given in meters and time is given in seconds**). Look at the force  $\cos(\theta)$  vs. position graph as well as the final velocity.

- a. What can you say about the relationship between the force applied and the work done?
  - i. Start the animation, push play, and then apply a force to the right, keeping the force large until the object leaves the screen. Right click on the plot to clone it for later examination and comparison.
  - ii. Do again but keep the force small (look at the arrow) until the object is off the screen. Clone the plot and compare to i. Discuss how "work" relates to what you see on the plots.
  
- b. How does the application of the force change the kinetic energy?
  - i. Apply a force to the right to get the object moving slowly. Consider the work you have done and the kinetic energy.
  
  - ii. Now consider how to apply a force (just a bump) to increase the kinetic energy.

$$KE_i = \underline{\hspace{2cm}}$$

$$KE_f = \underline{\hspace{2cm}}$$

How must you push in order to increase the KE (that is which way relative to motion)?

- iii. Again get the cart moving slowly to the right with an initial bump (or impulse) of force.
- iv. Instead of increasing the kinetic energy, now what must be done to decrease it?

$$KE_i = \underline{\hspace{2cm}}$$

$$KE_f = \underline{\hspace{2cm}} \text{ How must you push in order to decrease the KE?}$$

- v. Try this again but get the cart moving to the left to start with and then increase or decrease the kinetic energy.

- vi. What is the significance of the blue vs. yellow regions on the plots.

- vii. Can you make the Kinetic Energy negative; discuss?

- c. What happens when the mass changes?
- Try several different masses and push to give the cart the most kinetic energy that you are able to. Try a few times for each mass. Write down your results.

	KE trial 1	KE trial 2	KE trial 3	KE trial 4
m=				
m=				
m=				

- Just look at the largest kinetic energy you were able to give to each mass. Discuss whether the mass had an effect on this. Explain your answer.