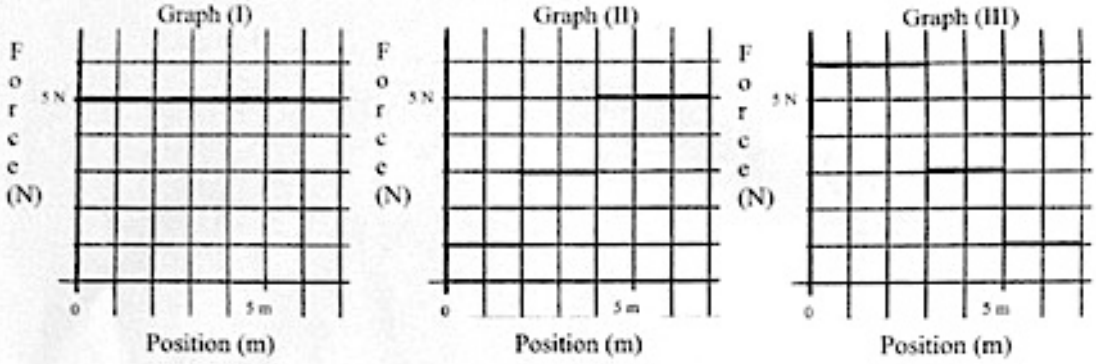
Name: Hr: AP Physics C Unit 7 Work Done Worksheet 4
To be Submitted

Work due to a Variable Force

Show your work or explain your reasoning as you answer each of these questions. Since all of the numerical answers are given, you must show the set-up.

Questions 1-4. Suppose that a 3.0 kg block is pulled along a horizontal frictionless surface by a horizontal force that is described by the graphs below.



1. In Graph (I), the force is a constant 5.0 Newtons for the entire 7.0 meters.
   a. Find the work done by the force during the 7.0 meters. *Ans 35 J*
   b. What is the final speed at x = 7.0 m if the block was initially at rest at x = 0 m? *Ans 4.5 m/s*

2. In Graph (II), the force increases along the motion.
   a. Find the work done by the force from x = 0.0 m to x = 2.0 m. *Ans 2.0 J*
   b. Find the work done by the force from x = 2.0 m to x = 4.0 m. *Ans 6.0 J*
   c. Find the work done by the force from x = 4.0 m to x = 7.0 m. *Ans 15.0 J*
   d. What is the total work done from x = 0.0 m to 7.0 m? *Ans 23.0 J*

3. In Graph (III), the force decreases along the motion.
   a. Find the work done by the force from x = 0.0 m to x = 7.0 m. *Ans 26.0 J*
   b. If the block starts moving at 1 m/s at x = 0.0 m, what is its speed at x = 7.0 m? *Ans*

4. If the force is a constant value over the section of motion, you can use the equation $W = \vec{F} \cdot \vec{d}$. If the force changes along the motion, you must break the motion into constant force sections. An easier way to represent this process is to use the graph. Shade the area on each graph that represents the work done by the force.

5. A block is pulled by a force that changes continuously with the position as shown on the right. In this case, $W = \vec{F} \cdot \vec{d}$ isn't appropriate because the constant force sections are mathematically small. The graphical method is still appropriate however.
   a. Shade the area of the graph that represents the work done by the force from x = 0.0 to x = 7.0 m.
   b. How much work is done by the force from x = 0.0 m to x = 7.0 m? *Ans 21.0 J*