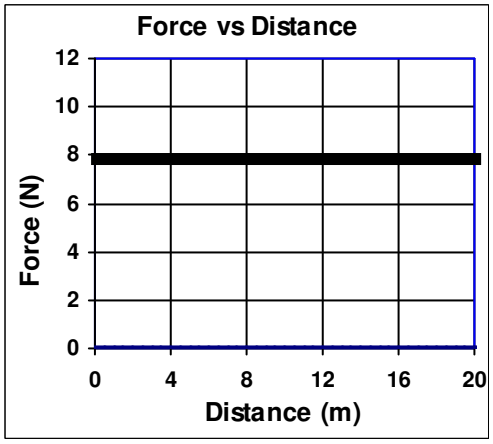
Due Fri., Nov 18

2011 PreAP Energy 8

1. A 20 kg object is moving 4 m/s to the left.
   A. Since it is moving to the left, is v positive or negative?
   B. * Calculate the object's kinetic energy.

2. A. Write the equation for power:
   B. For W, substitute Fd.
   C. What is d/t?
   D. * Write a new equation for power:

3. A person pushes on a object with 18N at 4 m/s. How much power is being expended?



4. A. Calculate the work done on the graph for the 20 m shown.

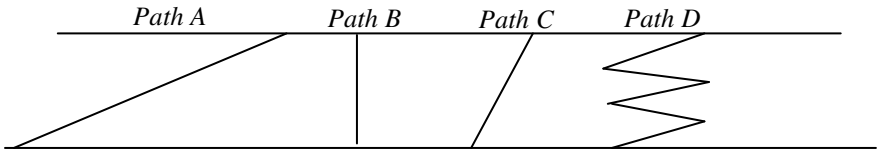
   B. If the force lifts a 50N object, how high was it lifted?

So, ANYTIME two quantities are multiplied in an equation (like F = ma, W = Fd, etc) on the graph you find the area.

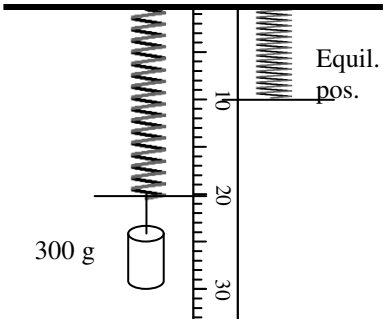
5. A 2 kg object is moving 2 m/s. It then accelerates to 4 m/s.
   A. Calculate its initial kinetic energy.

   B. Calculate its final kinetic energy.

   C. So, by doubling its speed, its kinetic energy:



6. An object is moved up the paths shown.
   A. If there is no friction, which path will give the most potential energy?
   B. If there is friction, which path will give the most potential energy?
   C. If there is friction, which will take the most work to move an object up?
   D. If there is friction, on which path will an object have the most kinetic energy at the bottom?
   E. Which path will require the most time (assuming constant velocity)?
   F. Which path will require the most power?



Lab questions:

7. A 300 g mass is placed on a spring that 10 cm long, when relaxed. The spring stretches to 20 cm.
   A. * Calculate the force pulling on the spring.

   B. * What is "x" in $\frac{1}{2}kx^2$?

   C. Calculate the spring constant for this spring.

But this is not the most accurate way of finding "k" because it assumes that any mass (even a gram) will stretch the spring, which is not always true. We graphed it, instead.

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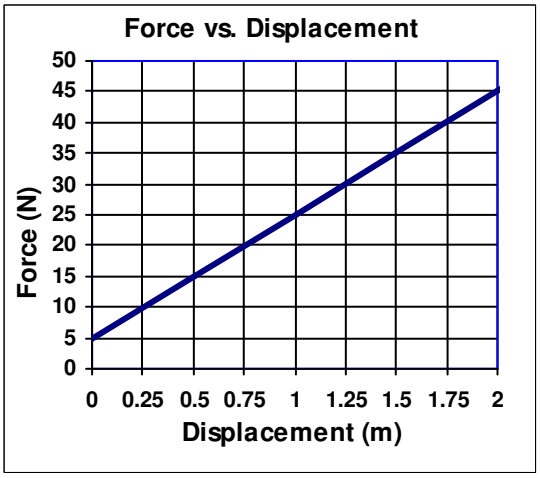
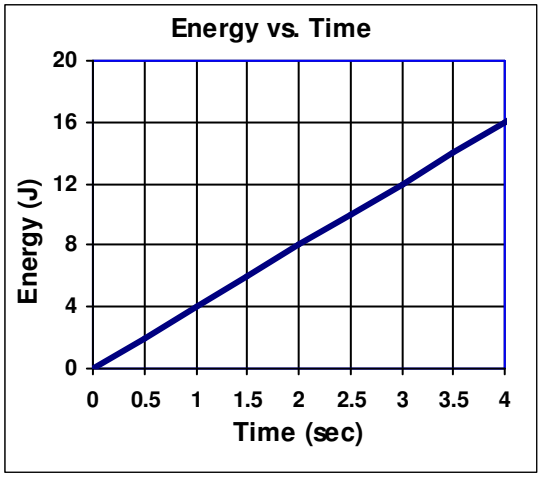


8. What are the units for the spring constant?
9. Calculate the spring constant shown on the graph at the left.

10. Which axis is dependent?
11. Which axis is independent?
12. Which axis is manipulated?
13. Which quantity did we manipulate?
14. Why did we switch our graph?



Turns out that ANYTIME there is division of units you look for the slope of a graph. Examples: N/m (spring constant); m = F/a; v = D/T; a = ΔV/t.

15. Given the units on the graph at the left, find the slope of the graph and figure out what it means (*units will help*).

Q1: $mgh = \frac{1}{2}mv^2$; v = 30 m/s; Q3B: 800 J; Q3D: 2 sec;
Q4B: since W = Fd and F = ma, then W = mad; Q4D: $(kgm/s^2)m = kgm^2/s^2$ Yup, that's what a joule equals.
Q10B: if point O is now our zero point, then h = 5 m and $mgh = \frac{1}{2}mv^2$; v = 10 m/s
Q11B: 160 joules. KE can't be negative
Q12D; W = Fv
Q17A. 1000g = 1 kg and Fw = mg, so F = 3N Q17B: 10 cm, which is 0.1 m (have to be in m)