Name:_____

Class Period: _____

Physics:

Problem Set - Work, Power, and Energy

*Set calculator to degrees

Concept Questions:

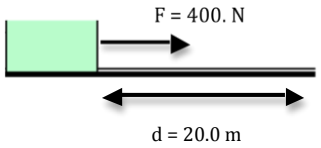
1. To get the **most** work out of a force, what should the angle between this force and the resulting motion be?

2. If you do not want **any** work to be done be a force, what should the angle between this force and the resulting movement be?

3. For each of the following situations, indicate whether the work done by the following forces was positive or negative work.
   A. The road exerts a frictional force on the tires of a car, making it skid to a stop.
   B. A rope exerts a force of tension on a bucket, making it accelerate upward.
   C. Resistance from the air is exerted on the parachute of a skydiver as he slowly descends toward the Earth.

Mathematical Questions:

4. A 400.0 N force accelerates a 750.0-kg mass from rest along a horizontal frictionless surface for a distance of 20.0 m as shown below.
   A. How much work is done on the mass by the 400.0 N force?
   B. What is the final velocity of the mass after moving 20.0 m?



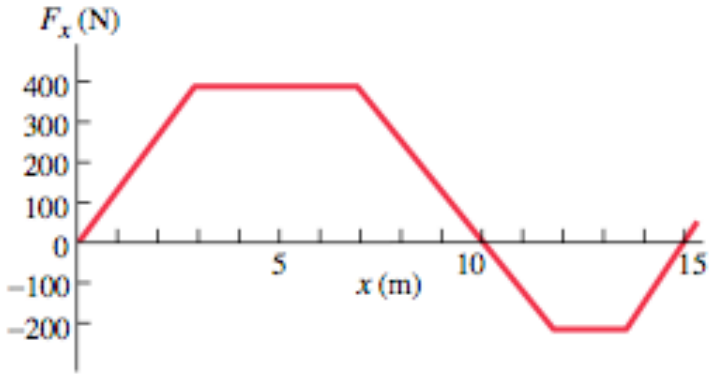
5. Sam is pushing a 10.0 kg sack of flour a distance of 4.70 m across a horizontal grocery store floor. He pushes with a force of 55.0 N. Unfortunately, friction is working against him. The coefficient of friction is 0.400.
   A. Calculate the work done by Sam's force.
   B. Calculate the work done by the force of friction
   C. Calculate the net amount of work.
   D. What is the velocity of the sack of flour after being moved 4.70 m if it begins from rest?

6. A 193 kg theater curtain needs to be lifted 7.50 m at a constant velocity in as close to 5.00 s as possible. The motor used to lift the curtain has three power settings (1.00×10^3 W, 3.50×10^3 W, and 5.50×10^3 W). Which setting is best for the job?

7. A little girl is playing on the slides at a playground. She begins from rest at the top of a slide that is 3.00 m tall. If she has a mass of 25.0 kg, use conservation of energy to determine what is her velocity at the bottom of the slide.

8. Sarah is changing a tire on her car. She is parked at the top of a hill, 20.0 m tall. She trips, loses her grip on the spare tire. She gives the tire an initial velocity of 1.86 m/s by accident.
   A. What kind or kinds of energy does the tire have at top of the hill?
   B. What kind or kinds of energy does the tire have half-way down the hill?
   C. What is the velocity of the tire when it is half-way down the hill?

9. Use the figure provided to answer the questions below. Assume the varying force being graphed is acting on a **25.0 kg object beginning at rest**.
   **Some points line up half-way between tick marks*



   A. What is the work done on the object from x = 0.00 m to x = 10.0 m?
   B. What is the work done on the object from x = 0.00 m to x = 15.0 m?
   C. What is the net or total amount of work down through the entire 15.0 m distance?
   D. What is the acceleration of the object at a distance x = 4.00 m?

Numerical Answers:

1. To get the **most** work, have an angle of 0^o
2. To get no work out of a force, there should be 90^o between the force and motion.
3. A.) Negative work from the force of friction
   B.) Positive work from the force of tension
   C.) Negative work from resistive force from air resistance.
4. A.) W = 8000 J
   B.) v_f = 4.62 m/s
5. A.) W ≈ 259 J
   B.) W ≈ -184 J
   C.) W_{net} ≈ 75 J
   D.) v_f = 3.87 m/s
6. Setting 2 (P = 3500 W) is the closest
7. v = 7.67 m/s
8. A.) Both KE and U
   B.) Both KE and U
   C.) v = 14.1 m/s
9. A.) 2800 J
   B.) – 700 J
   C.) 2100 J
   D.) 16 m/s^2