Work and Power

Name_____

Concepts:

1) What is work?

2) What is the equation for work?

3) What does it means that direction of the force and the displacement must be in the same direction?

4) How much work is done if I move an object (displacement) perpendicular to the force?

5) How much work is done if you return to where you started?

6) What does path independence mean?

7) How is displacement different from distance?

8) What is the difference between the three symbols used for multiplication (x , **·** , and parentheses)?

9) What is the unit for work?

10) How is work on a system different from work done by a system?

11) What is power?

13) What is equation for power?

14) What is the unit for power?

Exercises:

$$\text{Work} = \mathbf{F} \cdot \mathbf{\Delta S} \quad \text{or Work} = |F| \, |\mathbf{\Delta S}| \cos \theta$$

15) $\mathbf{F} = 10 \text{ N}, \quad \mathbf{\Delta S} = 4\text{m and } \theta = 0$ Find the work.

16) $\mathbf{F} = 10 \text{ N}, \quad \mathbf{\Delta S} = 4\text{m and } \theta = 90$ Find the work.

17)   Work = 25 Joules, $\quad \mathbf{\Delta S} = 7 \text{ m and } \theta = 0$ Find the force.

18)   Work = - 100 J and the displacement is 12 m, find the force.

19)   Work = 2300 J and the force is 75 N find the displacement.

20)   If the force is 30 N and the displacement is 5 m at an angle of 30 degrees, what is the work?

21)   If in the problem above it took 4 seconds how much power was used?

Problems:

22)   If you move from your car to the classroom you are lifting your weight up 4 meters. How much work have you done? If you it took you 4 minutes how powerful are you?

23)   If you stop a car with a force of 3000 N and it takes 13000 J of work to stop it, how long are your skid marks on the road (assume that the skid marks start and end exactly when you apply the force)?

24)   A Saturn Five Rocket has a mass of 2,500,000 kg , how much work is need to lift it 300 km into space?