Physics 3A: Basic Physics I
Quiz #7b: Solutions

Name: XXXXXXXXXXXXXXXXXXXX_____
Student ID #:_________________________
Discussion Section:____________________
Date:________________________________
Signature:____________________________

\[ W = \mathbf{F} \cdot \Delta \mathbf{r} \]
\[ \mathbf{A} \cdot \mathbf{B} = |A||B|\cos(\theta) \]
\[ W = \int_{x_i}^{x_f} \mathbf{F}_x \, dx \]
\[ K = \frac{1}{2} m v^2 \]
\[ W_{\text{net}} = K_f - K_i \]
\[ \overrightarrow{P} = \frac{W}{\Delta t} \]

\[ P = \frac{dW}{dt} = \mathbf{F} \cdot \dot{\mathbf{r}} \]
\[ P = \frac{dE}{dt} \]
\[ E_i = E_f \]
\[ \Delta E_{\text{int}} = f_k \Delta x \]
\[ \Delta K = -f_k \Delta x + \sum W_{\text{other forces}} \]

(circle the letter of your answer)

1. (2 pts) If the net work done on an object is zero during some displacement, what can you say about the forces on the object?

a.) Nothing.
b.) That all the forces on the object were perpendicular to the displacement.
c.) That the net force on the object parallel to the displacement was zero.
d.) The torques they produced were perfectly balanced.
e.) none of the above

2. (2 pts) A block is held at rest at the top of an inclined plane. There is a spring at the bottom of the incline. The block is let go and it slides down and makes contact with the spring. As the spring is compressed by the block, the spring does ______ work on the block. The block comes to rest and then the spring pushes the block back up the incline. While the spring is pushing the block back up the incline, the spring does ______ work on the block.

a.) positive, positive
b.) negative, negative
c.) positive, negative
d.) negative, positive
e.) none of the above

3. (6 pts) You drag your 22.5 kg stubborn dog over a rough horizontal surface by pulling on her leash with a force of 55.0 N acting 35.0° above the horizontal. You drag her for 4.55 m and the coefficient of kinetic friction is 0.255. Find the work done by: a.) you pulling on the leash, b.) the work done by gravity. c.) What is the total change in the dog's kinetic energy? (use back of sheet as well, circle your final answer and show all work)
a.) Work done by your force? Your force is constant, so use:

\[ W = F \cdot \Delta x \cdot \cos(\theta) = (55.0)(4.55)\cos(35.0) = 205 \text{ Nm} = \boxed{205 \text{ J}} \]

b.) Work done by gravity on dog is zero during displacement because weight of dog is perpendicular to displacement.

c.) Change in dog’s kinetic energy? Use:

\[ \sum W = \Delta K + \Delta E_{\text{int}} \]
\[ \Delta K = W_g - \Delta E_{\text{int}} \]
\[ \Delta K = W_g - f_k \Delta x = W_g - \mu_k N \Delta x = W_g - \mu_k (mg - F\sin(\theta)) \Delta x \]
\[ \Delta K = 205 - 0.255((22.5)(9.80) - 55.0 \sin(35.0))(4.55) = \boxed{-14.2 \text{ J}} \]