Lab 3.1 Work and Energy

Objectives
- Calculate work done by you in various situations
- Determine the work done in stretching a rubber band

Task 1. Answer the concept questions on work-energy.
1. Is it possible to do work on an object that remains at rest?
   A) Yes
   B) No

2. A box is being pulled across a rough floor at a constant speed. What can you say about the work done by friction?
   A) friction does no work at all
   B) friction does negative work
   C) friction does positive work

3. Can friction ever do positive work?
   A) Yes
   B) No

4. A ball tied to a string is being whirled around at a constant speed in a circle. What can you say about the work done by the tension force in the string?
   A) tension does no work at all
   B) tension does negative work
   C) tension does positive work

5. A box is being pulled up a rough incline by a rope connected to a pulley. How many forces are doing non-zero work on the box?
   A) one force
   B) two forces
   C) three forces
   D) four forces
   E) no forces are doing work

6. A golfer making a putt gives the ball an initial velocity of $v_0$, but he has badly misjudged the putt, and the ball only travels one-quarter of the distance to the hole. If the resistance force due to the grass is constant, what speed should he have given the ball (from its original position) in order to make it into the hole?
   A) $2v_0$
   B) $3v_0$
   C) $4v_0$
   D) $8v_0$
   E) $16v_0$
**Task 2.** Determine the work done by you in the following situations.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Work</th>
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<tbody>
<tr>
<td>Pulling horizontally with a force of 20 N on a 100 N sled. Sled moves 2 m at a constant velocity.</td>
<td>Slowly lifting a 10 lb weight from the floor to a 3 ft high table.</td>
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<td>Pulling horizontally with a force of 40 N on a 100 N sled. Sled moves 2 m at a constant acceleration.</td>
<td>Carrying a 10 lb weight 30 ft across the room.</td>
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<tr>
<td>Pushing at $30^\circ$ from horizontal with a force of 40 N on a 100 N sled. Sled moves 2 m at a constant velocity.</td>
<td>Slowly moving a 10 lb weight from a 3 ft high table to the floor.</td>
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**Task 3. Rubber Band**

(a) Obtain a force-displacement curve for stretching a rubber band. Be sure to measure displacement ($L - L_0$).

(b) What is the work done to stretch the rubber band 0.2m?

(c) Predict how far the rubber band will fly if stretched 0.2m and shot horizontally from a height of 1 m. (mass=1g)

(d) Test your theory by shooting a rubber band at your TA.