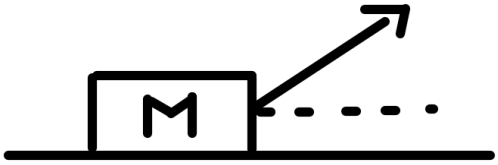
AP Physics C: Mechanics Name: _____

Unit 3 Quiz Class Period: _____

Show all steps required to arrive at your answer and give answers with the correct. Most of your grade on the following questions will be based on correct justification and not the final answer.

1. Hello, what have we here? Lando pulls a box of M = 30 kg across a flat surface for 20 m at constant velocity. The coefficient of friction between the crate and ground is 0.20. Lando pulls the box with a force that is direction at an angle of $\theta = 45°$ above the horizontal as shown.



   a) Draw a free body diagram of all forces acting on the block.

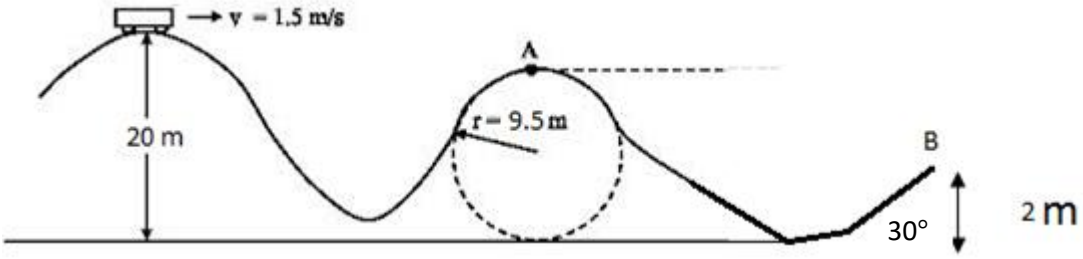
   b) Identify a force that does negative work. Calculate the sign and magnitude of that work.

   c) Identify a force that does positive work. Calculate the sign and magnitude of that work.

   d) Identify a force that does zero work. Calculate the work done by that force ;-).

2. At time t=0, an object is at rest when it undergoes an acceleration given by: $a(t) = 4t + \sin \pi t$. Find the work done in an object from t = 0 s to t = 2 s.

3. A roller coaster is set up as shown. The track is frictionless.



a) Calculate the normal force exerted on a 50 kg rider at point A.

b) At point B, the coaster cart leaves the track in order to catch some sick air. Find the maximum height reached by the coaster using conservation of energy.