

PHY2053 Spring 2018 Homework # 3

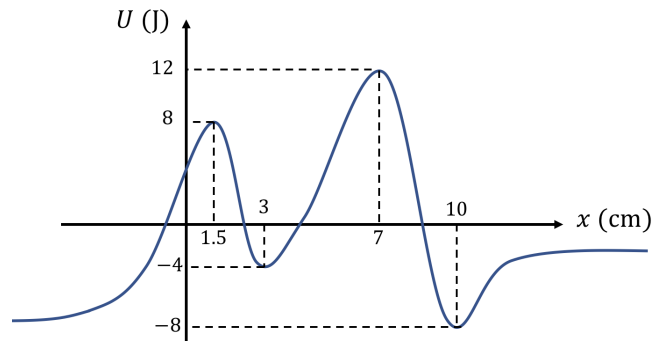
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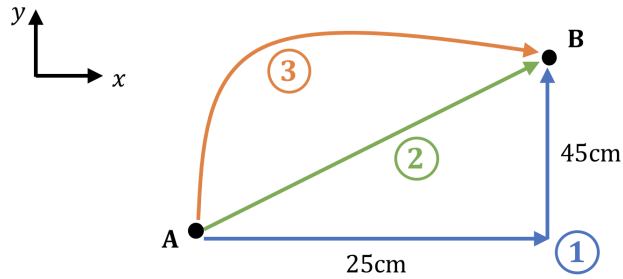
Abstract

In this homework assignment, you'll be solving problems dealing with Energy Physics (chapters 7 and 8 in Walker). This homework set is due **Tuesday, March 20**.

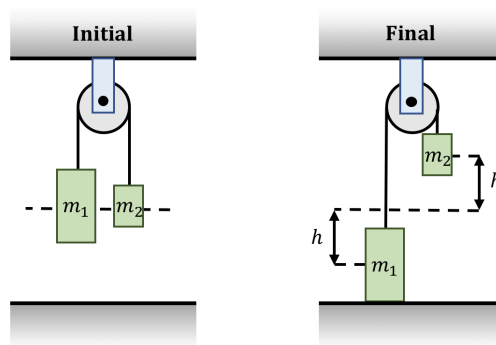
1. A 2kg box is pushed across a horizontal surface with a force of 20N, at an angle of 10° above the horizontal. If the surface has a coefficient of kinetic friction of $\mu_k = 0.35$, and the box is pushed a distance of 8.5m,
 - (a) How much work is done by each force?
 - (b) If the box started at 5 m/s, what is the final speed of the box?



2. Consider a 3.5kg object under the influence of the potential energy graphed in the figure above.
 - (a) List all stable and unstable equilibrium points.
 - (b) If the object starts from $x = -\infty$ with an energy $E = 9$ J, describe the object's motion.
 - (c) If the object starts from $x = 3$ cm with an energy $E = 5$ J, describe the object's motion.
 - (d) If the object starts from $x = -\infty$ with an energy $E = 9$ J, how fast is the object going at $x = 3$ cm?



3. Consider moving a 3kg mass along one of three possible paths, as shown in the figure above. What is the work done by gravity along each path?
4. A 350g ball is dropped from a height of 24cm, bouncing off of the floor. If the ball loses 20% of its total energy in the bounce, to what height does the ball bounce back up to?
5. A 1200kg car drives up a 20m hill, starting at 8 m/s and reaching the top at 10 m/s.
 - (a) How much work was done by gravity during this trip?
 - (b) Assuming no air resistance, how much work was done by the car's engine?



6. In the above figure is an Atwood machine: a machine composed of two blocks, one of mass $m_1 = 250\text{g}$ and one of mass $m_2 = 100\text{g}$, a massless rope and a massless pulley. If the two masses are released from rest as shown in the figure, at what speed does m_1 hit the ground after falling some $h = 12\text{cm}$?