

PHY 107

HW 4

Due April 22, 2021 (11:45 pm)

NOTE You may write on paper, scan them and merge them all into 1 single PDF and submit on google classroom.

Q1

Is positive or negative work done by a constant force \vec{F} on a particle during a straight-line displacement \vec{d} if (a) the angle between \vec{F} and \vec{d} is 30° ; (b) the angle is 100° ; (c) $\vec{F} = 2\hat{i} - 3\hat{j}$ and $\vec{d} = -4\hat{i}$? [2+2+2]

Q2

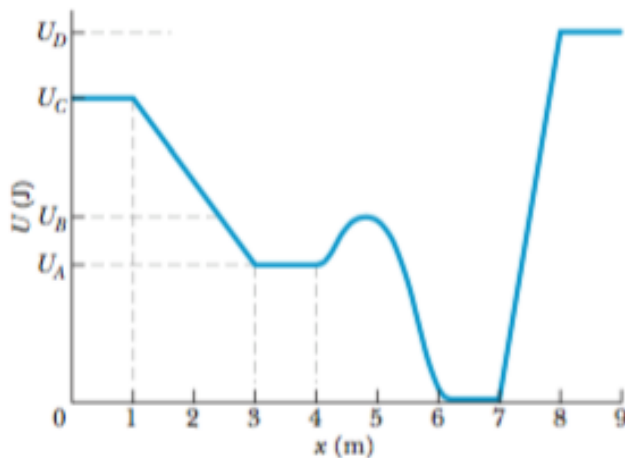
A force $\vec{F} = (cx - 3.00x^2)\hat{i}$ acts on a particle as the particle moves along an x axis, with \vec{F} in newtons, x in meters, and c a constant. At $x=0$, the particle's kinetic energy is 20 J; at $x = 3.00$ m, it is 11 J. Find c. [5]

Q3

What is the spring constant of a spring that stores 25 J of elastic potential energy when compressed by 7.5 cm? [2]

Q4

The figure below shows a plot of potential energy U versus position x of a 0.200 kg particle that can travel only along an x axis under the influence of a conservative force. The graph has these values: $U_A = 9.00J$, $U_C = 20.00J$, and $U_D = 24.00J$. The particle is released at the point where U forms a potential hill of height $U_B = 12.00J$, with kinetic energy 4.00 J. What is the speed of the particle at (a) $x = 3.5$ m? What is the position of the turning point on (b) the right side and (c) the left side? [2+2+2]



Q5

A rope is used to pull a 3.57 kg block at constant speed 4.06 m along a horizontal floor. The force on the block from the rope is 7.68 N and directed $\theta = 15.0^\circ$ above the horizontal. What are (a) the work done by the rope's force, (b) the increase in thermal energy of the block-floor system, and (c) the coefficient of kinetic friction between the block and floor? [2+2+2]