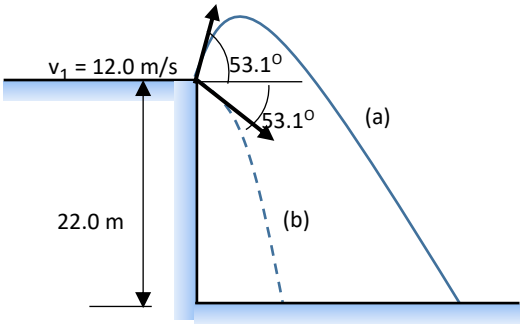
Example 1

A baseball is thrown from the roof of a 22.0 -m-tall building with an initilal velocity of magnititude 12.0 m/s and directed at an angle 53.1^{O} above the horizontal.

a) What is the speed of the ball just before it strikes the ground? Use energy method and ignore air resistance.

b) What is the answer for part (a) if the initial velocity is at an angle 53.1^{O} below the horizontal?

c) If the effect of air resistance are included, will part (a) and (b) give the higher speed?



Example 2

A 10.0-kg microwave oven is pushed 8.00 m up the sloping surface to a loading ramp inclined at an angle of 36.9^{O} above horizontal by a constant force ***F*** with a magnitude110 N and acting parallel to ramp. Coefficient of kinetic friction between the oven and surface is 0.250.

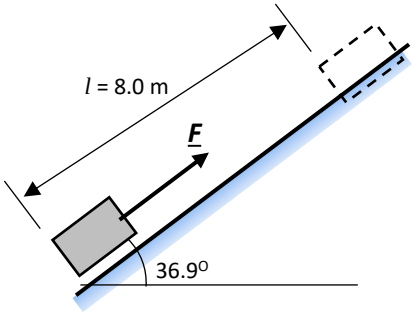
a) What is the work done on the oven by the force ***F*** ?

b) What is the work done on the oven by the friction force?

c) Compute the increase in potential energy for the oven.

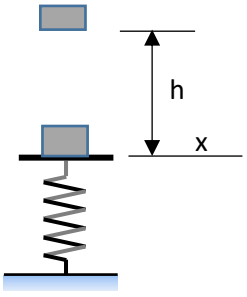
d) Use your answers to parts (a), (b), and c) to calculate the increase in the oven's kinetic energy.

e) Use $\Sigma \boldsymbol{F} = m\,\boldsymbol{a}$ to calculate the acceleration of the oven. Assuming that the oven is initially at rest, use the acceleration to calculate the oven's speed after traveling 8.0 m. From this, compute the increase in the oven's kinetic energy, and compare it to the answer you got in part (d).



Example 3

A 1.20-kg piece of cheese is placed on a vertical spring of negligible mass and force constant k = 1800 N/m that is compressed 15.0 cm. When the spring is released, how high does the cheese rise from this initial position? (The cheese and spring are not attached.)

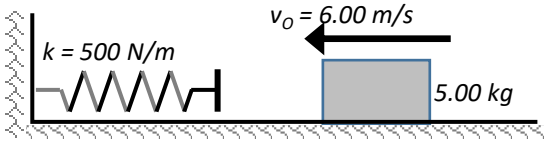


Example 4

A 5.00-kg block is moving at v_O = 6.00 m/s along a frictionless, horizontal surface toward a spring with a constant of k = 500 N/mthat is attached to a wall. The spring has negligible mass.

a) Find the maximum distance the spring will be compressed.

b) If the the spring is to compress by no more than 0.150 m, what should be the maximum value of v_O?



Example 5 7.30 Sec. 7.3

In an experiment, one of the forces exerted on a proton is $\underline{\boldsymbol{F}} = -\alpha x^2 \underline{\boldsymbol{i}}$, where $\alpha = 12\ N/m^2$.

a) How much work does $\underline{\boldsymbol{F}}$ do when the proton moves along the straight-line path from the point (0.10 m , 0) to the point (0.1 m, 0.40m)?

b) Along the staright line path from the point (0.10 m, 0) to the point (0.30 m, 0)?

c) Along the staright line path from the point (0.30 m, 0) to the point (0.10 m, 0)?

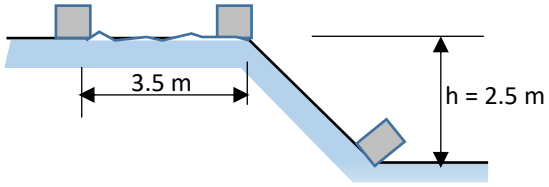
d) Is the force $\underline{\boldsymbol{F}}$ conservative? Explain. If $\underline{\boldsymbol{F}}$ is conservative, what is the potential-energy function for it? Let U = 0 when x = 0

Example 6

A 62.0-kg skier is moving at 6.50 m/s on a frictionless, horizontal, snow-covered plateau when she encounters a rough patch 3.50 m long. The coefficient of kinetic friction between this patch and her skies is 0.300. After crossing the rough patch and returning to friction-free snow, she skies down an icy, frictionless hill 2.5 m high.

a) How fast is the skier moving when she gets to the bottom of the hill?

b) How much internal energy was generated in crossing the rough patch?



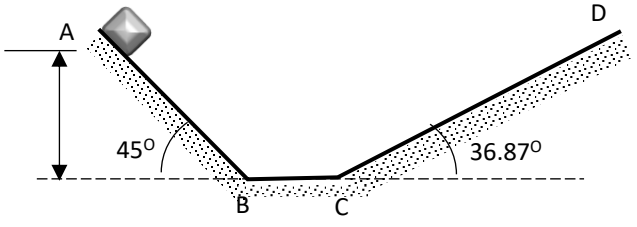
Example 6.1 Sec. 7.3

A block of mass 100 kg slide down a frictionless incline AB, and then on a short horizontal frictionless surface BC. The block then moves up another incline CD which has a kinetic friction coefficient of μ_k = 0.25. Determine:

a) the vlocity of the block when it reaches point B

b) the acceleration of the block when it reaches point B

c) how far the block moves up the incline CD.

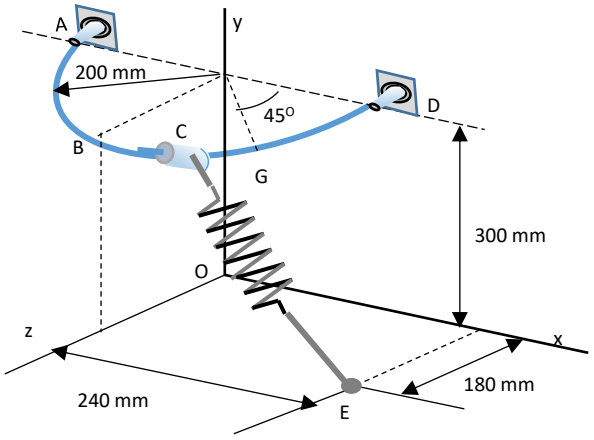


A 600-g collar C may slide along horizontal, semicircular rod ABD. The spring CE has an undeformed length of 250 mm and a spring constant of 135 N/m. Knowing that the collar is released from rest at A and neglecting friction, determine the speed of collar

a) at B,

b) at D.

c) at G which makes an angle 45^{O} with positive x-axis



The 1-kg ball at A is suspended by an inextensible cord and given an initial velocity of v_O = 5 m/s. If the cord length, l = 0.6 m and x_B = 0, determine y_B so that the ball will enter the basket.