Problem Set No.6   D. Farivar, Ph.D., P.E.

PHYSICS 21

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1) A package of 20.0 lb is dragged by friction15.0 feet up along a moving surface of a conveyor belt inclined at angle of 36.9^O above horizontal. If the package's speed is a constant 1.0 inch/s, how much work is done on the package by:

a) by friction?   b) gravity, and c) the normal force of the conveyor belt?

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2) A rock weighing 25-N is thrown vertically into the air from ground level. When it reaches 15.0 m above ground, it is traveling at 25.0 m/s upward. Use the work-energy theorem to find:

a) the rock's speed just as it left the ground,   b) it maximum height.

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3) Someone is dragging a 7.5-kg box on a horizontal, frictionless surface with a velocity of 3.5 m/s. The box runs into a spring of force constant k = 80 N/cm. Use the work-energy theorem to find the maximum compression of the spring.

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4) A force described by $\underline{F}$ = (45 N) $\underline{i}$ - (50 N) $\underline{j}$ is applied to an object causes it to undergo a displacemet defined by $\underline{s}$ = (-8.0 m) $\underline{i}$ - (3.0 m) $\underline{j}$. How much work did the force apply to the object?

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5) A light box with a mass of 0.10 kg is placed against a compressed spring at the bottom of a track that slopes upward at an angle of 40.0^O above horizontal. The spring constant k = 650 N/m with negligible mass. When the spring is released, the box travels a maximum distance of 1.75 m along the track before sliding back down. Before reaching this distance, the box loses contact with the spring.

a) What distance was the spring compressed initially?

b) When the box has traveled the track 0.75 m from its initial position against the compressed spring, is it still in contact with the spring

c) What is the kinetic energy of the box at this point?

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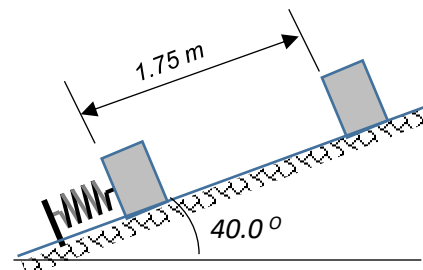
6) An empty elevator with a mass of 680 kg is designed to ascend at constant speed, a vertical distance of 18.0 m in 16.0 s, and it is driven by a motor that can provide up to 45 hp to the elevator. What is the maximum number of passengers (capacity) that can ride in the elevator assuming that an average person weighs 640 N.