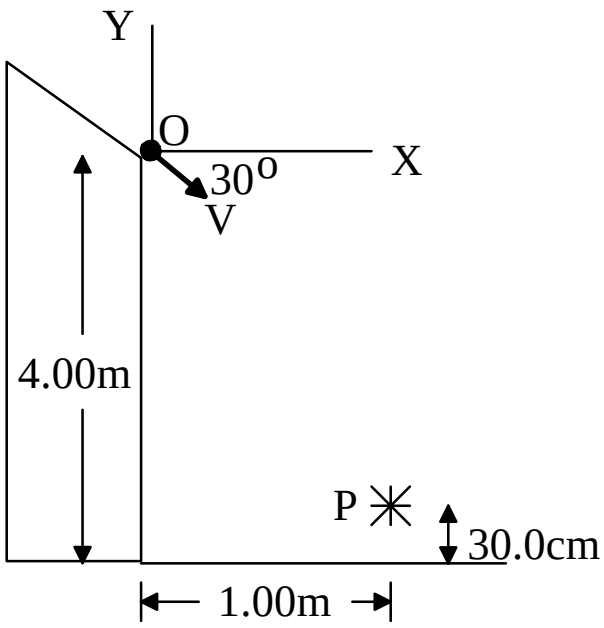
Phy 1350 Final Exam Fall 1995



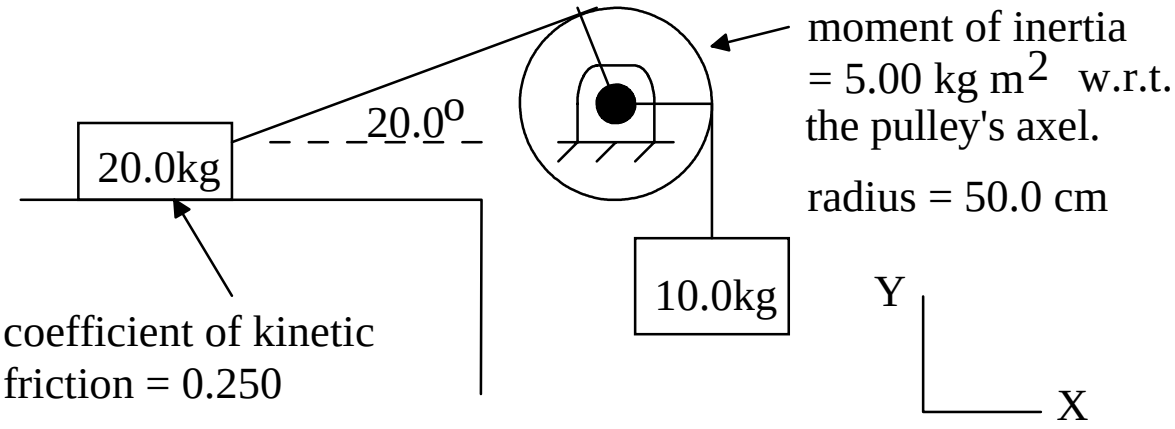
1. A point object is at the origin O at time t = 0.00 seconds. It has a velocity of V at 30° below the x-axis. One standard Earth gravity acts upon the object during its free flight from point O to point P.

(a.) In terms of the unknown V, time t, and the given coordinate system, write down an equation which predicts the horizontal position of the object as a function of time.

(b.) Write down a similar equation for the vertical postition of the point object.

(c.) If the object is found to pass through point P, determine the numerical value of V and the time to reach this point.

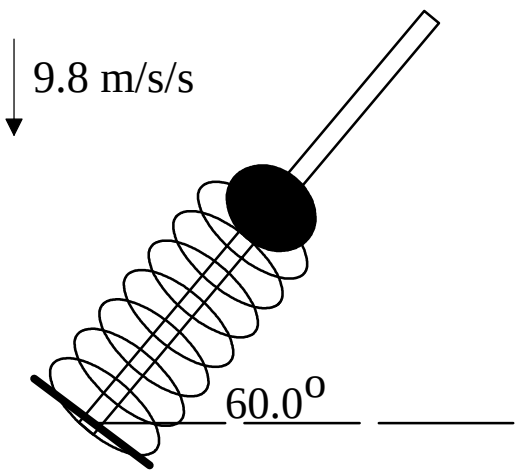
2.



A 20.0 kg block is free to slide on a horizontal surface whose coefficient of kinetic friction with the block is 0.250. The 20.0 kg block is pulled by a cord which is wound around a pulley and then attached to a 10.0 kg block which hangs vertically downward under the influence of one standard Earth gravity. There is no friction in the pulley's axel.

(a.) Draw a free body diagram for each of the two blocks and for the pulley.
(b.) In terms of suitable unknowns, write down the appropriate Newton's equation(s) for the 20.0 kg block.
(c.) In terms of suitable unknowns, write down the appropriate Newton's equation(s) for the 10.0 kg block.
(d.) Write down the appropriate equations for the pulley.
(e.) Solve to find the acceleration of the 10.0 kg block at the instant shown above.

3.



A 5000. gram bead slides along a pole whose end-to-end length is 200. cm. There is a kinetic friction sliding force of 90.0 Newtons between the pole and the bead. The natural length of the spring is 200. cm, and its spring constant is 600. N/m. The bead is initially at rest at the end of the spring which is compressed to half its natural length. The bead is then released and is propelled along the rod by the spring, eventually leaving it and becoming a free projectile.

(a.) If the dashed line represents zero gravitational potential energy, how much energy does the spring-bead-earth system have initially?

(b.) How fast is the bead moving just as it leaves the rod?

(c.) How high above the dashed line does the bead get during its projectile motion?

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4. An object oscillates with simple harmonic motion along the x axis at a rate of 4.00 cycles per second. At t=0, the object's x position is 6.00 cm and its velocity is -240 cm/s. Determine the object's position versus time equation.

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5. At a certain point (A) in a water pipe in the Physical Science Building, the cross-sectional area is 0.500 square centimeters and the water speed is 10.0 m/s. The tube bends upward from this point to a point (B) which is 10.0 m higher than (A) and has a cross-sectional area of 2.00 square centimeters. The water leaves the pipe at (B) where it is exposed to 1 Earth atmosphere. What is the water pressure at point (A)?

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6. A cannon ball is dropped from rest from a height of 3 Earth radii **above the surface** of the Earth. When the ball is 1 Earth radius **above the Earth's surface**, how fast is the ball moving?

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7. A 30.0 kg child and a 45.0 kg child are sliding directly toward each other on a horizontal, and nearly frictionless, ice rink. The 30.0 kg child has a speed of 3.00m/s. The 45.0 kg child has a speed of 4.5 m/s. After colliding, the two children cling to each other and therefore move with a common speed. Determine the direction and speed of the pair after the collision.