**PH 111** Fall Term 2016

Physics I

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| Practice Problems – Set A |

1. When dealing with mathematical models of physical processes, what should you always make yourself aware of before using any mathematical or numerical model? Explain.
2. A child throws a marble in the air with an initial velocity *v*o. Another child drops a ball at the same instant. Compare the accelerations of the two objects while they are in flight.

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1. Can a particle accelerate if its speed is constant? Can it accelerate if its velocity is constant? Explain.
2. A bullet is fired horizontally from a gun at the same instant an identical bullet is dropped from the same height. Assume that air resistance is negligible. Which bullet will hit the ground first, assuming that the ground over the range of the fired bullet is flat and completely horizontal? Explain.

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1. As a projectile moves through its parabolic trajectory, which of the quantities, if any, are constant? (A) speed, (B) acceleration, (C) horizontal component of velocity, (D) vertical component of velocity. Explain.
2. What is the acceleration of a ball that is thrown straight up when it is at its highest point above the ground? Explain.

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1. The displacement versus time for a certain particle moving along the *x*-axis is shown in the figure below. Find the (A) average velocity for the interval 0 to 2 s, (B) instantaneous velocity at 3 s, (C) average velocity for the interval 0 to 8 s and (D) average speed for the interval 0 to 8s.

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1. An inquisitive physics student and mountain climber climbs a 50.0-m cliff that overhangs a calm pool of water. He throws two stones vertically downward 1.00 s apart and observes that they cause a single splash. The first stone has an initial velocity of 2.00 m/s. (A) At what time after release of the first stone will the two stones hit the water? (B) What initial velocity must the second stone have if they are to hit simultaneously? (C) What will the velocity of each stone be at the instant they hit the water?
2. A stone is thrown upwards from the edge of a cliff 18.0 m high. It just misses the cliff on the way down and hits the ground below with a speed of 18.8 m/s. (A) With what velocity was it released? (B) What is its maximum distance from the ground during its flight?

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1. A place kicker must kick a football from a point 36.0 m (about 40 yards) from the goal and the ball must clear the crossbar, which is 3.05 m high. When kicked, the ball leaves the ground with a speed of 20.0 m/s at an angle of 53.0° to the horizontal. (A) By how much does the ball clear or fall short of clearing the crossbar? (B) Does the ball approach the crossbar while still rising or while falling?

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1. The orbit of the moon about the earth is approximately circular, with a mean radius of 3.84 × 108 m. It takes 27.3 days for the moon to complete one revolution about the earth. Find (A) the mean orbital speed of the moon and (B) its centripetal acceleration.
2. A lead ball is dropped into a lake from a diving board 5.0 m above the water. After entering the water, it sinks to the bottom with a constant velocity equal to the velocity with which it hit the water. The ball reaches the bottom 3.0s after it is released. How deep is the lake?

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1. After delivering his toys in the usual manner, Santa decides to have some fun and slide down an icy roof inclined at 37.0˚, as shown below. He starts from rest at the top of the roof, which is 8.00 m in length, and accelerates at the rate of 5.00 m/s2. The edge of the roof is 6.00 m above a soft snowbank, which Santa lands on. Find (A) Santa’s velocity components when he reaches the snowbank, (B) the total time he is in motion and (C) the distance *d* between the house and the point where he lands in the snow.

