Kinematics II

1. A stone is thrown horizontally. In 0.5 s second after the stone began to move, the numerical value of its velocity was 1.5 times its initial velocity. Find the initial velocity of the stone. Disregard the the resistance of the air.

2. A stone is thrown horizontally with the velocity $v_x = 15\ m/s$. Determine the normal and tangential accelerations of the stone in 1 s after it begins to move. Disregard the the resistance of the air.

3. A body is thrown with the velocity v_0 at an angle to the horizon. The duration of motion $t = 2.2\ s$. Find the maximum height reached by the body. Disregard the the resistance of the air.

4. A boy throws a ball with the velocity $v_0 = 10\ m/s$ at an angle of $\alpha = 45^o$ to the horizon. The ball strikes a wall at a distance of $s = 3\ m$ from the boy. (1) When will the ball strike the wall (when the ball ascends or descends)? (2) Find the height y at which the ball will strike the wall. (3) Determine the velocity of the ball at the moment of impact.

5. The zoo keeper points a tranquilizer gun directly at the monkey and shoots (Fig.1.). The clever monkey jumps at the same instant the dart leaves the gun barrel, intending to land on the ground and escape. Show that the dart *always* hits the monkey, regardless of the dart's muzzle velocity (provided that it gets to the monkey before he hits the ground).

6. A point moves along a circle with a radius of $r = 2\ cm$. The relationship between the distance and the time is given by the equation $x = Ct^3$, where $C = 0.1\ cm/s^2$. Find the normal and tangential accelerations of the point at the moment when its linear velocity $v = 0.3\ m/s$.

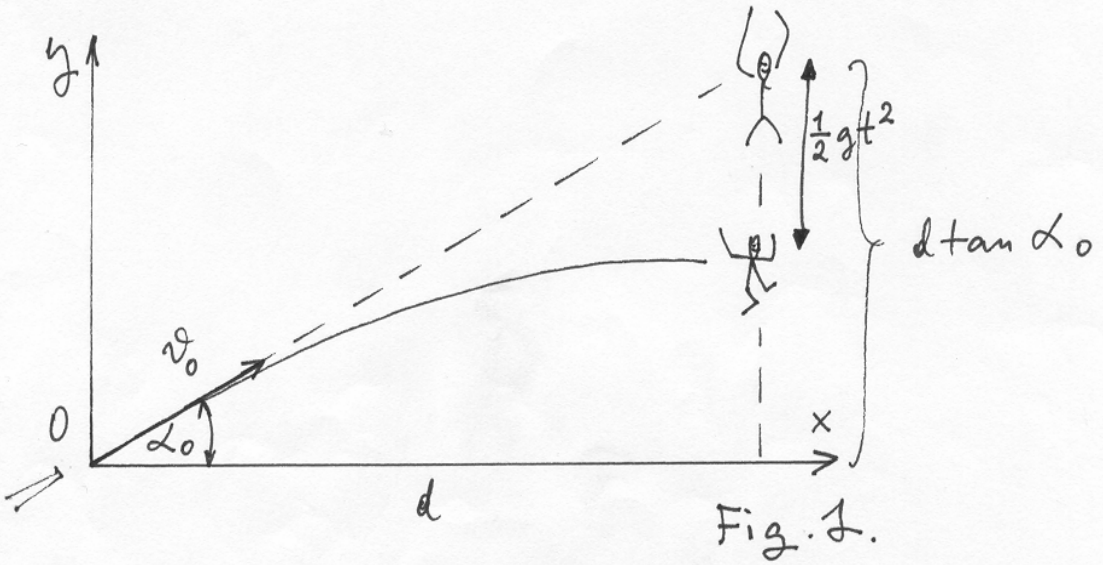

Fig. 1.