Kinematics I

1. A car travels at a velocity of 80 km/h during the first half of its running time and at 40 km/h during the other half. Find the average velocity of the car.

2. A ship goes from A to B along a river at $v_1 = 10\ km/h$ and from B to A at $v_2 = 16\ km/h$. Find: (1) the average velocity of the ship, and (2) the velocity of the river's current.

3. A boat moves perpendicularly to the bank of a river with a velocity of 7.2 km/h. The current carries it 150 m downstream. Find: (1) the velocity of the current, (2) the time required to cross the river. The river is 0.5 km wide.

4. The relationship between the distance s traveled by a body and the time t is expressed by the equation $s = A - Bt + Ct^2$, where $A = 6\ m$, $B = 3\ m/s$ and $C = 2\ m/s^2$. Determine the average velocity and the average acceleration of the body within the time interval from 1 to 4 seconds. Plot the diagram of the distance, velocity and acceleration for $0 \leq t \leq 5$.

5. A body thrown vertically upward returns to the Earth in 3 seconds. (1) What is the initial velocity of the body? (2) What height did the body reach? Disregard the resistance of the air.

6. During the last second of its free fall a body covers half of the total distance traveled. Find: (1) the height h from which the body falls, (2) the duration of falling.

7. The maximum height from which a person can safely jump is 2.45 m. What is the maximum allowable landing speed for a parachutist?

8. A flower pot falls off a balcony. It takes 0.1 s to pass a window of height 1.25 m. From what height above the bottom of the window did it fall?