USEFUL RESOURCES

The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
    `https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2023`
The practical information about the club and contacts can be found on the same web page.

TODAY'S MEETING

Today we discussed all of the problems of the previous assignment.

HOMEWORK

The new topic is Newton's laws.

1. A hockey puck hit with a stick slides on the ice for 5 seconds and travels 20 meters before stopping. Mass of the puck is 100 grams. Find the force of friction acting on the puck while it was sliding (assuming it was constant).

2. Two blocks on a smooth horizontal surface are connected with a thread that would break under tension larger than a critical T_{cr}. Masses of the blocks are m_1 and m_2. What is the maximal force F one can pull block m_1 with so that the thread does not break?

3. Find the acceleration of the movable pulley in the system shown on the figure. Assume that pulleys are ropes are massless and the ropes are unstretchable.
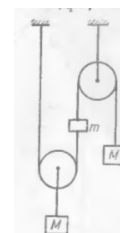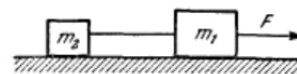
4. A painter works on a hanging platform. He urgently needs to go up and starts pulling the rope. As a result the force with which he presses on the platform becomes less by 400 Newtons. Mass of the painter is 72 kg and mass of the platform is 12 kg. Find the acceleration with which the platform and the painter move.
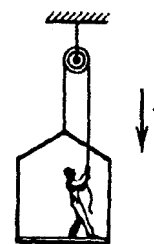
5. A hot air balloon has a rope attached to it hanging overboard that may be partially on the ground. Mass of the balloon together with the rope is m, buoyancy force in the air acting on the balloon is F and the friction coefficient between the rope and the ground is μ. There is wind blowing horizontally with speed u. Air drag force acting on the moving balloon is proportional to the square of its speed with respect to the air: $f = \alpha v^2$. Find the speed of the balloon with respect to the ground.
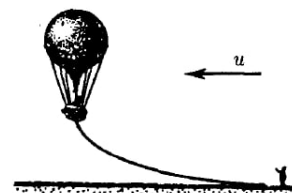
6. A styrofoam cube with mass $M = 100$ grams rests on a horizontal stand. Length of a side of the cube is $h = 10$ cm. An upward-moving bullet with mass $m = 10$ grams hits the cube from below. It enters the cube with a speed $v_1 = 100$ m/s and flies out of the cube with a speed $v_2 = 95$ m/s. Will the cube jump above the stand?

*7. A square curtain is hanging down vertically, attached by its top side to a horizontal rod. Then the bottom side of the curtain is elevated to the same level as the top side, so that the curtain gets folded in two. Find how the force acting on the rod depends on time after the elevated end of the curtain is let go. Assume that the curtain is thin and soft. The size of the curtain is 1.5 m × 1.5 m, its mass is 3 kg.

*8. A ball of radius R rests on a smooth surface of a cart. The cart starts moving with speed v_0. Find the horizontal component of the velocity of the ball when it hits the floor.

For the next meeting

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **November 12**.